Water Quality and Temperature Data Collected Up to March, 1986 from Federal Salmonid Enhancement Facilities in British Columbia and the Yukon

Volume I

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WATER QUALITY AND TEMPERATURE DATA COLLECTED UP TO MARCH, 1986 FROM FEDERAL SALMONID ENHANCEMENT FACILITIES IN BRITISH COLUMBIA AND THE YUKON

Volume I

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ABSTRACT

R.E. Miller, D.D. MacKinlay, C. Harlton, P. O'Hearn and L. Chan. 1986. Water quality and temperature data collected to March, 1986 from federal salmonid enhancement facilities in British Columbia and the Yukon. Can. Data Rep. Fish. Aquat. Sci. 643: iv + 471 p. (2 vol.)

This report provides summary tables of water quality analyses and temperature monitoring from 27 major facilities of the Salmonid Enhancement Program in British Columbia and the Yukon.

RESUME

R.E. Miller, D.D. MacKinlay, C. Harlton, P. O'Hearn and L. Chan. 1986. Water quality and temperature data collected to March, 1986 from federal salmonid enhancement facilities in British Columbia and the Yukon. Can. Data Rep. Fish. Aquat. Sci. 643: iv + 471 p. (2 vol.)

On présente des tableaux sommaires des résultats de l'analyse de la qualité et de la température de l'eau obtenus de 27 facilités major du programme de mise en valeur des salmonides dans la région du Pacifique

INTRODUCTION

This report presents data on water quality and temperatures from the water sources for 27 facilities operated by the Enhancement Operations Division (EOD) of the Salmonid Enhancement Program (SEP) in the Pacific Region of Canada. The report does not include data from other SEP projects operated through the auspices of the Special Projects Division (volunteers, community groups or small pilot projects) or un-manned projects run by SEP. The format of the report was patterned after that of MacKinlay (1984), to facilitate comparisons between new sites and existing facilities.

METHODS

Data Collection

The data presented in this report were compiled from a variety of existing water quality and temperature sampling records, including:

1. New Projects Unit reconnaissance records already stored on computer files
2. Operations Units records obtained directly from facilities or from the support biologists.
3. Records at the EPS/DFO Water Quality Laboratory located at Cypress Creek in West Vancouver, where all the laboratory analyses were carried out.

Compilation from multiple sources usually allowed for cross checking of the data to minimize transcription errors. The data were all entered into a storage system using Apple II microcomputers (MacKinlay, 1987). The current report consists mainly of printouts (tabular and graphic) from the computer files, which are stored on floppy disks.

Water Sampling

Water quality sampling generally followed prescribed procedures outlined in EPS/DFO (1982) and MacKinlay (1984). A synopsis is given here for reference.

Normally, each sampling involved the filling of three plastic bottles with water. A 2 L bottle was rinsed three times, then used to fill two 100 mL or 200 mLhbottles. The first small bottle contained concentrated nitric acid preservative (added at a rate of 5 mL/L) which helped to keep dissolved metals in solution so that they would not be absorbed into the plastic walls of the container. The second small bottle contained concentrated nitric dichromate (added at a rate of 50 mL/L), meant to keep mercury in solution. The 2 L bottle was then refilled for nutrients and residues analysis. The bottles were tightly capped, labelled "Metals", "Mercury" and "Nutrients/NFR" respectively and kept in a cooler on ice until delivery to the lab, usually within 48 hr of collection.

Samples from the three bottles were analyzed in detail at the EPS/DFO Water Quality Laboratory at Cypress Creek in West Vancouver using the methods summarized in Table 1. Values suitable for fish culture for each parameter are also listed in Table 1. Toxic and recommended values are taken mostly from EPA (1976), Thurston et al, (1979) and SIGMA Environmental Consultants (1983). These values are considered only rough guides to help point out potential problem areas.

Some parameters can change value very quickly after sample collection and were normally measured at the sample collection site in the following manner:

pH: Most well samples were measured with a pH meter calibrated with buffer solutions, (accuracy ± 0.1 pH units) whereas most surface samples were measured with HACH comparator kits (wide range, brom cresol or phenol red reagents with an accuracy of ± 0.2 - 1.0 pH units). Well sample values are therefore usually more accurate.

Temperature: Calibrated mercury thermometers of various sizes and qualities were used (accuracy ± 0.05 - 0.5 °C). On occasion, thermister probes on meters were used, with calibration by an ASTM calibrated reference thermometer.

Dissolved Oxygen (DO): Well samples were measured with dissolved oxygen meters of various makes and accuracies, and surface waters with HACH field DO kits (modified Winkler titration using powder packets for reagents). Some samples were analyzed by the standard modified Winkler titration method (Greenberg et al., 1981). Glass sample bottles or probes were immersed in an undisturbed, flowing stream of water to get a representative sample.

Dissolved Gas Pressure: tensionometers made by Novatech Designs (Victoria, B.C.) (Models 300B or 300C; accuracy ± 7mm Hg) were normally used to measure the difference in partial pressure between the total gases in solution in the sampled water, and the saturation value at local atmospheric pressure. Percent saturation of total gases and of nitrogen were calculated from the tunsionometer reading, local atmospheric barometric pressure, water temperature and dissolved oxygen

Table 1. Laboratory Analysis Techiques used for Water Quality Parameters (EPS/DFO, 1979)

Parameter Name	Analysis Technique	Reported Units	Normal Precision	Detection Limit	Reccomend Limit	Toxic Limit
Alkalinity	Potentiometric Titration	mg/L as CaCO3	+1.0	>1.0	20-300	
Ammonia	Phenolhypochlorite Colorimetric	mg/L as N	+1%	>0.005	<0.002	>0.8
Chloride	Thiocyanate-Combined Reagent	mg/L	+0.1 mg/L	>0.5	<170	>400
Conductivity	Tristimulus	Colour Units	+5 units	>1.0	<15	
Conductivity	Conductivity Cell	umbos/cm	+3%	0	150-2000	
Hardness	AAS	mg/L as CaCO3	+5%	>0.03	20-400	
Nitrite	Diazonization-Colorimetric	mg/L as N	+0.8%	>0.005	<0.012	0.2
Nitrate	Cadmium-Copper Reduction	mg/L as N	+2.3%	>0.01	<0.12	
pH-Hydrogen ion	Potentiometric	pH units	+1.9%	0	6.8-8.5	<5, >9
Phosphate	Acid-Persulfate-Autoclave Digest	mg/L P		>0.005	<0.05	
Residue-filterable	Filtration, Evaporation	mg/L	+10%	>5.0	70-4000	
Residue-nonfilterable	Filtration, Drying	mg/L	+10%	>5.0	<3	
Silica	Ascorbic Acid Reduction	mg/L	+0.04	>0.5	<10	
Sulphate	Barium Chloranilate	mg/L	+0.5	>1.0	<90	
Turbidity	Nephelometric	Formazin (FTU)	N/A	>1.0	1-60	>1000
Metals						
Al-Aluminum	AES	mg/L		>0.09	<0.1	>5
As-Arsenic	AES	mg/L		>0.05	<0.5	>1
Ba-Barium	AES	mg/L		>0.001	<1	
Ca-Calcium	AES	mg/L		>0.001	4-150	>300
Cd-Cadmium	AAS	mg/L		>0.005	<0.0004	
Co-Cobalt	AES	mg/L		>0.005		
Cr-Chromium	AES	mg/L		>0.001	<0.01	
Cu-Copper	AAS	mg/L			<0.006	
Fe-Iron	AES	mg/L			<0.3	
Hg-Mercury	AAS	mg/L		>0.0002	<0.00005	>0.0002
K-Potassium	AES	mg/L				>50
Mg-Magnesium	AES	mg/L			<10	>100
Mn-Manganese	AES	mg/L			<0.05	>15
Mo-Molybdenum	AES	mg/L		>0.005		
Na-Sodium	AES	mg/L				>500
Ni-Nickel	AES	mg/L		>0.02		
P--Phosphorus	AES	mg/L		>0.05		
Pb-Lead	AAS	mg/L		>0.001	<0.01	
Sb-Antimony	AES	mg/L		>0.05		
Se-Selenium	AES	mg/L		>0.05		>2.5
Si-Silicon	AES	mg/L			<10	
Sn-Tin	AES	mg/L		>0.1		
Sr-Strontium	AES	mg/L				
Ti-Titanium	AES	mg/L		>0.002		
V--Vanadium	AES	mg/L		>0.01		
Zn-Zinc	AAS	mg/L		>0.001	<.005	

All metals were analysed using Atomic Emmsion Spectophotometry (AES) using an Inductively Coupled Argon Plasma (ICAP) excitation source coupled to a computer controlled Optical Emission Spectrometer (OES). In addition, increased sensitivity analysis was carried out for toxic heavy metals (Cd, Cu, Hg, Pb, Zn) using flameless Atomic Absorption Spectrophotometry (AAS). The more sensitive value is reported in the tables.

content.

Water temperature data were collected with a variety of different thermometers and thermographs, during both reconnaissance and operation of the hatcheries.

Data from the thermograph tapes or other source with daily, weekly or intermittent temperature records were stored in a numeric data file on APPLE II floppy disks. Programs (described in MacKinlay, 1986) were developed to enter and manipulate data and to print the data out in tabular or graphical form.

Data Presentation

The data are presented in a standard format for each facility. First, a short description of the facility is given. This description includes the location and capacity of the facility, comments on the water sources used, and specifics about sample sites or particular records.

Second, water quality data are presented in tables by water source and sampling date (column heading) and parameter (rows). The tables were printed out from computer files stored in VisiCalc spreadsheet format on "5-1/4 inch" floppy disks accessed through Apple II series microcomputers. VisiCalc, although not really suitable to storage of large data banks, is very easy to use in storing and manipulating small, one or two-page data sets. Detailed descriptions oV VisiCalc functions are found in the manual supplied with the product. Copies of these computer files can be made from diskettes available from New Projects Unit of SEP. Parameters in the tables are subdivided into two sections, non-metals preceding metals, their abbreviations arranged alphabetically in each section for easy reference. Metals are listed by international element symbols (eg. iron = Fe, mercury = Hg).

Third, water temperature data are presented for each location and year, both as tables of monthly minima, maxima and means, and as plots of temperature versus date. For data available only as monthly summaries, tables only are presented.

Sample Timing

The timing of sampling for most of the sites is summarized in Table 2. Samples from all years were superimposed in this table, to show the seasonal coverage for each site. This compilation was done both for water quality

Table 2. Summary of Sampling and Monitoring Timings

	Type	Jan 1	Feb 1	Mar 1	Apr 1	May 1	Jun 1	Jul 1	Aug 1	Sep 1	Oct 1	Nov 1	Dec 1
Big Qualicum													
-Chum Spawning Channel	WQ	*	*	*	*	**	****	***	**	**	** *	*	*
-Mundie Channel	WQ	*	*	**	**	*	****	***	**	**	** *	*	*
-Incubation Room	WT	—	—	—	—	—	—	—			—	—	—
Birkenhead													
-Birkenhead River	WQ	*	*	*	*	*						*	
	WT	—	—	—	—	—	—	—	—	—	—	—	—
-Well	WQ	*			**	*						**	
Capilano													
-Capilano River	WQ			*	*	*	*	*	* *	*	* *		
	WT	—	—	—	—	—	—	—	—	—	—	—	—
-Groundwater	WQ										*		
Chehalis													
-Chehalis River	WQ		**		* *	*	*	*				*	*
	WT	—	—	—	—	—	—	—	—	—	—	—	—
-Well # 1	WQ	*	**		*							*	*
	WT				—	—		–			—		
-Well # 2	WQ	*	*		*							*	*
	WT			—							—		
-Well # 3	WQ	*	*					*			*	*	*
-Mixed Wells	WQ	* *	** *	*		*							***
	WT	—	—	—	—	—	—	—	—	—	—	—	—
Chemainus													
-Reservoir	WQ			*									
	WT												
-Well	WQ			*									
	WT	—	—	—	—	—	—				—	—	—
Chilliwack													
-Chilliwack River	WQ	* *	* *	****	** *	* *	*	**	** *	* *	*	** **	*
	WT	—	—	—	—	—	—	—	—	—	—	—	—
-Well # 1	WQ	* *	***	****	** *	* *	*	**	** *	* *	*	*** *	*
-Well # 2	WQ	* *	***	****	** *	***	*	**	*** *	* *	*	** **	*
-Well # 3	WQ							***					
Clearwater													
-Clearwater River	WQ											*	
-Well TW-C1	WQ		*	*							*	*	
-Well TW-C2	WQ			*									
-Well TW-C3	WQ			***									
Coruma													
-Coruma River	WQ			* *	*	*					**		
-Well # 1	WQ	*	*	*	*		* *			*			***
-Well # 2	WQ	**		*	*		* *						***
-Well # 3	WQ	*		*	*		* *						
-Well # 4	WQ	*		*	*		**						
-Well # 5	WQ			*	*						**		
-Well # 6	WQ				**						*		
-Mixed Wells	WT									—	—	—	—
-Leagh Creek	WQ	**		*** *	**		***			*		**	
	WT	—	—	—	—	—	—	—	—	—	—	—	—

Table 2. Summary of Sampling con´d

```
                             Type |Jan Feb Mar Apr May Jun Jul Aug Sep Oct Nov Dec |
                                  |1   1   1   1   1   1   1   1   1   1   1   1   |
                             _______________________________________________________
Devereux                          |                                                |
   -Devereux Creek             WQ |           *                 *                  |
                               WT |________________________     ___________________|
   -Devereux Lake              WQ |                                   *  ** *      |
                               WT |                            ____________________|
Eagle                             |                                                |
   -Eagle River                WQ |             * *                                |
                               WT |                       ______________________   |
   -Crazy Creek                WQ |          *   *           **   * *    *    *    |
                               WT |________    ________________________________    |
   -Well # 1                   WQ |    * *** *    *  *                    *        |
                               WT |_____________________           ________________|
   -Well # 2                   WQ |     **   * *  *  *                    *   *    |
                               WT |________________________________________________|
Fulton                            |                                                |
   -Spawning Chan.1, inlet     WQ |*   **  *       *       *   * * *   *   *  **   |
   -Spawning Chan.2, inlet     WQ |     *  *                   *           *  *    |
   -Base of Dam                WQ |     *  *                               * *     |
   -Mill Pool                  WQ |                            *                   |
   -Resevoir                   WQ |    *   *  *                            *  *    |
   -Fulton River               WQ |    *   *                   *           *  *    |
                               WT |________________________________________________|
Inch Creek                        |                                                |
   -Well # 1                   WQ |    *                             *          ** |
                               WT |________________________________________________|
   -Well # 2                   WQ |    *                      *  *   *          ** |
                               WT |__________________  __     _  ______           _|
   -Mixed wells                WQ |                           *  *           *   * |
                               WT |                                 __________ ____|
Kitimat                           |                                                |
   -Kitimat River              WQ |*              *   **  ** * * ***  **   *  *  * |
                               WT |________________________________________________|
   -Eurocan Supply             WQ | * *   *    *         * *     *    *      **    |
   -Hot Water                  WQ | ****        **                  ****** **      |
   -Well 79-1                  WQ | *****   *  ********      *   *    *************|
                               WT |__________________ _____________ _______________|
   -Well 80-1                  WQ | *****   *   **  ***        * *  *********  ****|
                               WT |_______________  _ ____________  ________  _____|
   -Well 84-1                  WQ |                                               *|
                               WT |                                    _____  _____|
   -Mixed Wells                WT |_________________           ____________________|
Little Qualicum                   |                                                |
   -Spawning Channel           WQ | *       *       *                              |
   -Rearing Channel            WQ | *       *       *                              |
   -Little Qualicum River      WT |________________________________________________|
   -Domestic Well              WQ | *       *       **                             |
                               WT |                                                |
   -Swamp                      WQ |         *                                      |
                               WT |________________________          ______________|
```

Table 2. Summary of Sampling con'd

	Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		1	1	1	1	1	1	1	1	1	1	1	1
Mathers													
-Mathers Creek	WQ	** *	*		***	**	*	*	**	* *	***	*	*
	WT	—	—	—	—	—	—			—	—	—	—
-Well # 1	WQ		*			*			*		*		
-Well # 2	WQ										*		
-Well # 3	WQ								*				
-Mixed Wells	WT	—	—	—	—	—						—	—
Nitinat													
-Nitinat River	WQ	**		* *	* *	*	* *				*	* *	*
	WT	—	—	—	—	—	—	—	—	—	—	—	—
-Well DH-1	WQ		*				*						*
	WT												
-Well DH-2	WQ		*		*								
	WT												
-Well DH-3	WQ	*			*		*					**	*
	WT	—			—	—	—	—	—		—	—	—
-Well DH-4	WQ				*	*	**					*	*
	WT	—	—	—	—	—			—		—	—	—
-Well DH-5	WQ	**	*	*	*		*					**	*
	WT	—	—	—			—	—			—	—	—
-Well OW-1	WQ		*				*				*		
	WT	—	—	—	—					—	—	—	—
Pallant													
-Pallant Creek	WQ	*	*	*	**	** *	**	*	*	**	*	* *	* *
	WT	—	—	—	—	—	—	—	—	—	—	—	—
-Pallant Hatchery	WQ		*		*						*		
-Braverman	WQ		*										
Pinkut													
-Spawning Channel	WQ		*				*		* *	* *	*	**	
-Pinkut Creek	WQ											*	
	WT	—	—	—	—	—	—	—	—	—	—	—	—
Lower Puntledge													
-Incubation	WQ	* *	****	***	****	****	** *	** *	* *	** *	****	** *	***
Upper Puntledge													
-Puntledge River *	WQ	* *	*	* *	***	** *	**	** *	* *	* *	** *	* **	* *
	WT	—	—	—	—	—	—	—	—	—	—	—	—
-Puntledge River	WQ	* *	* **	*	***	*	* *	** *	* **	** *	***	* *	***
Tsolum Satellite													
-Headquarters Creek	WQ	* *	** *	****	****	***	**	**	*	* *	***	* *	**
	WT	—	—	—	—	—	—	—	—	—	—	—	—
Quesnel													
-Hatchery	WQ				*								
-Hatchery spring	WQ				*								
-Quesnel River	WQ				* *	* *	*	*	* *	*	* *		*
	WT	—	—	—	—	—	—	—	—	—	—	—	—
-Well FW-1	WQ		*	*	*								
	WT	—	—	—	—	—		—	—	—	—	—	—
-Well FW-2	WQ				*								
	WT	—	—	—	—	—		—	—	—	—	—	—
-Well FW-3	WQ							*					
	WT	—	—	—	—	—	—	—	—	—	—	—	—
-Well TW-2	WQ												*
	WT	—	—	—	—	—	—	—	—	—	—	—	—

Table 2. Summary of Sampling con´d

	Type	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
		1	1	1	1	1	1	1	1	1	1	1	1
Quinsam													
-Quinsam River	WQ	* **	**	*	* *	**	*	**	*	**	*	**	*
	WT	—	—	—	—	—	—	—	—	—	—	—	—
-Cold Creek	WQ			*	*				*				*
	WT	—	—	—	—	—	—	—	—	—	—	—	—
Robertson Creek													
-Robertson Creek	WT	—	—	—	—	—	—	—	—	—	—	—	—
-Incubation	WQ				*	*	*						
(Great Central Lake)	WT					—	—	—	—	—	—		
-Well # 3	WQ				*	* **							*
Shuswap													
-Shuswap River	WQ			*		*	*						
	WT			—	—	—	—						
-Well # 5	WQ			*		*					*		
	WT						—	—	—	—	—	—	
-Well # 6	WQ			*									
	WT	—	—	—	—	—	—						
-Well # 10	WQ					**							
Snootli													
-Snootli Creek	WQ												
	WT	—	—	—	—	—	—	—	—	—	—	—	—
-Well # 1	WQ				*								
-Well # 2	WQ				*								
-Well # 3	WQ			*									
-Well # 7	WQ								*				
-Well SP-1	WQ								*				
-Well SP-2	WQ								*				
-Mixed Wells	WQ		*	* *	* *	* **	*		*				
	WT	—	—	—	—	—	—	—	—	—	—	—	—
Spius													
-Spius Creek	WQ		*	*	*				*		*		
	WT			-	—	—	- -	-	—	—	—	—	
-Well	WQ												
-Well A	WQ		**	*									
-Well B	WQ			**									
-Well C	WQ		**	*	*		*						
-Mixed Wells	WQ		*										
Tenderfoot													
-Well # 1	WQ											*	
-Well # 2	WQ	*										*	
-Well # 3	WQ	*			**	*							
-Mixed Wells	WQ	*					*						
Whitehorse													
-Yukon River	WT								—	—	—		
-City Well # 4	WQ			*									
-Well RH-2-85	WQ											**	
-Mixed Wells	WQ						*						
-Hatchery	WQ											*	

(WQ) and water temperature (WT).

In table 2, each month is split into four weeks, such that a dash in the first column for WT indicates that a record was taken during the first week of January in one or more years. A star in the 10th column for WQ indicates that at least one water quality sample was taken during t e second week of March. The weeks were split by date (first week = days 1 to 7, second = days 8 to 14, third = days 15 to 21, fourth = days 22 to end).

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Facility: BIG QUALICUM

Location:

Located 60 km northwest of Nanaimo off the Vancouver Island Highway.

Description:

The first phase, including river flow and temperature control, was completed in 1963. The second phase, consisting of two spawning channels, was completed in 1967. The hatchery program started in 1968. By 1971 it had been converted from an experimental hatchery to a major production facility, dealing with native chum, coho, chinook and steelhead stocks.

Egg production targets in 1985 were 3.58 M coho, 9.4 M chinook, 136.5 M chum, 180 K steelhead and 12 K cutthroat. Eggs are taken from Big Qualicum River, Little Qualicum River and Englishman River stocks.

Water Sources:

Surface. All water is taken from the Big Qualicum River. Pumps and three surface gravity intakes are used. As well, there is a tunnel supply from Horne Lake, capable of drawing water from 0 m, 60 m and 90 m depths. Water from each depth can be mixed, which allows some temperature control.

Groundwater. None used.

General Water Quality:

The Big Qualicum River supplies abundant amounts of excellent quality water, other than a minor supersaturation.

Special Notes:

Water quality values for both Mundie Channel and the Chum Spawning Channel are for water entering the channels directly from the river, and thus are representative of Big Qualicum River water in general. Water temperature records taken in the incubation room are from completely untreated incoming river water, and are thus representative of Big Qualicum River water. The incubation room is the closest point to the river where daily temperature records have been taken.

WATER QUALITY VALUES FOR BIG QUALICUM;SPAWNING CHANNEL
(below detection limits = 0)

PARAMETERS	AUG31/78 CHANNEL ENTRANCE	SEP20/78 CHANNEL ENTRANCE	OCT10/78 CHANNEL ENTRANCE	OCT31/78 CHANNEL ENTRANCE	NOV21/78 CHANNEL ENTRANCE	DEC19/78 CHANNEL ENTRANCE	JAN30/79 CHANNEL ENTRANCE	FEB27/79 CHANNEL ENTRANCE	MAR26/79 CHANNEL ENTRANCE	APR24/79 CHANNEL ENTRANCE	MAY28/79 CHANNEL ENTRANCE
Alkalinity	37.2	34.7	31.3	33.3	33.7	33.5	35.3	33.2	33.6	33.7	35.5
Ammonia			0	.0118	.0335	.0575	.018	.011	.0085	.0075	.0067
CO2											
Chloride	1.55	1.45	1.3	1.55	1.5	1.5	1.33	1.5	1.2	1.47	1.3
Color											
Conductivity Field											
Conductivity Lab	82.5	78	72	74	74.5	75.5	78.2	75.8	76.6	77	76.5
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	41.6	36.9	36.8	35.1	35.1	37.6	37.5	32.9	34.8	35.7	34.8
Nitrite			0	0	0	0	0	0	0	0	0
Nitrate			.021	.012	.032	.055	.061	.103	.066	.0605	.0366
pH-Field	7.8	7.7	7.6	7.7	7.6	7.6	7.7	7.6	7.6	7.8	7.6
pH-Lab											
Phosphate			.005	.005	.0155	.013	.0125	.0085	.0075	.0074	.011
Residue Filterable	65	66	51	49	52	52	54	56	51	54	56
Residue Non-Filter	0	0	0	0	0	0	8	0	6	0	0
Silica	3.53	3.11	2.58	2.4	2.53	2	2.85	3.23	2.88	2.92	3.18
Sulphate	2	1.8	2.2	2	2.06	1.8	2.4	2.4	2.2	2.2	1.9
Taste											
Temperature											
Turbidity										0	0
METALS—											
Al-Aluminum										0	0
As-Arsenic										0	0
Ba-Barium										0	0
Ca-Calcium	13.6	11.8	12.1	11.4	11.4	12.3	12.1	11	11.4	11.7	11.4
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt										0	0
Cr-Chromium										0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.058	.045	.033	.03	.033	.06	.033	.065	.05	.037	.044
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K—Potassium	.188	.153	.116	.115	.142	.147	.129	.142	.131	.125	.148
Mg-Magnesium	1.87	1.81	1.6	1.6	1.61	1.72	1.77	1.32	1.54	1.57	1.55
Mn-Manganese										.0053	.0058
Mo-Molybdenum										0	0
Na-Sodium	1.65	1.42	1.35	1.11	.98	1.13	1.14	1.61	1.19	1.19	1.17
Ni-Nickle										0	0
P—Phosphorus										0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony										0	0
Se-Selenium										0	0
Si-Silicon										3.1	2.98
Sn-Tin										.8	0
Sr-Strontium										.0191	.0193
Ti-Titanium										0	0
V—Vanadium										0	0
Zn-Zinc	0	0	0	.113	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR QUALICUM;SPAWNING CHANNEL
(below detection limits = 0)

PARAMETERS	JUN18/79 . CHANNEL ENTRANCE	JUL09/79 CHANNEL ENTRANCE	JUL30/79 CHANNEL ENTRANCE	AUG20/79 CHANNEL ENTRANCE	SEP11/79 CHANNEL ENTRANCE	OCT04/79 CHANNEL ENTRANCE	MAY27/80 CHANNEL ENTRANCE	JUN26/80 CHANNEL ENTRANCE	JUL30/80 CHANNEL ENTRANCE
Alkalinity	39.1	38.7	38.4	38	73.2		31.5	35	37.2
Ammonia	.011	0	.005	.0072	.0055		0	.0075	95
CO2									
Chloride	1.4	1.48	1.35	1.38	1.45		1.41	1.09	1.65
Color									
Conductivity Field									
Conductivity Lab	86.5	86	84	85.4	86		74	74	79.5
Dissolved O2-ppm									
Dissolved O2-%sat									
Dissolved Gas Tot									
Dissolved Nitrogen									
Hardness	42.8	38.8	38.5	39.7	38.9	40.2	36.1	34.2	38.2
Nitrite	0	0	0	0			0	0	0
Nitrate	.036	.0364	.0352	.0395	.0554		.0566	.061	.068
pH-Field	7.8	7.9	7.9	7.7	7.7		7.6	7.8	7.5
pH-Lab									
Phosphate	.0155	.012	.0106	.011	.0081		.0095	.0086	.0104
Residue Filterable	60	61	58	64	60		50	0	52
Residue Non-Filter	0	0	0	0	0		0	0	0
Silica	3.68	3.65	3.68	3.65	3.85		2.83	3.28	3.2
Sulphate	1.9	2.1	1.4	1.8	2.3		2.5	3	1.9
Taste									
Temperature									6.3
Turbidity	1.1	0	0	0	0		0	0	1.2
METALS--									
Al-Aluminum	0	0	0	0	0		0	0	0
As-Arsenic	0	0	0	0	0		0	0	0
Ba-Barium	0	0	0	0	.0034		0	.0041	.0038
Ca-Calcium	14.1	11.8	11.9	12.4	12.3	13.3	12.1	11	12.6
Cd-Cadmium	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0		0	0	0
Cr-Chromium	0	0	0	0	0		0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0
Fe-Iron	.046	.053	.054	.046	.054	.036	.039	.048	.042
Hg-Mercury	0	0	0	0	.0003	0	0	0	0
K--Potassium	.199	.185	.204	.2	.209	.126	.133	.146	.186
Mg-Magnesium	1.85	2.26	2.14	2.11	1.99	1.7	1.43	1.64	1.63
Mn-Manganese	.0063	.0071	.0074	.0056	.0064		.0064	.007	.0076
Mo-Molybdenum	0	0	0	0	0		0	0	0
Na-Sodium	1.26	1.62	1.47	1.84	1.52	1.29	1.21	1.2	1.64
Ni-Nickle	0	0	0	0	0		0	0	0
P--Phosphorus	0	0	0	0	0		0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0		0	0	0
Se-Seleniium	0	0	0	0	0		0	0	0
Si-Silicon	3.15	3.54	3.53	3.58	3.5		2.73	3.17	2.97
Sn-Tin		0	0	0	0		0	0	0
Sr-Strontium	.0207	.0208	.0208	.0218	.0214		.0173	.018	.0198
Ti-Titanium	0	0	0	0	0		0	0	0
V--Vanadium	0	0	0	0	0		0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR BIG QUALICUM; MUNDIE CHANNEL
(below detection limits = 0)

PARAMETERS	AUG31/78 CHANNEL ENTRANCE	SEP20/78 CHANNEL ENTRANCE	OCT10/78 CHANNEL ENTRANCE	OCT31/78 CHANNEL ENTRANCE	NOV21/78 CHANNEL ENTRANCE	DEC19/78 CHANNEL ENTRANCE	JAN30/79 CHANNEL ENTRANCE	FEB27/79 CHANNEL ENTRANCE	MAR28/79 CHANNEL ENTRANCE	APR24/79 CHANNEL ENTRANCE	MAY28/79 CHANNEL ENTRANCE
Alkalinity	36.3	33.7	31.8	33.3	33.2	32.5	34	32.8	32	33.4	35
Ammonia			0	.011	.138	.017	.005	.0055	.005	.0054	.0054
CO2											
Chloride	1.46	1.45	1.3	1.55	1.38	1.4	1.25	1.4	1.2	1.41	1.25
Color											
Conductivity Field											
Conductivity Lab	81.3	76	72	73.5	74.5	74.5	76.3	75.5	73.9	78	76.4
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	40.3	36.5	36.3	34.7	34.8	37.6	38.6	33.8	34.1	34.7	34.7
Nitrite			0	0	0	0	0	0	0	0	0
Nitrate			.012	.01	.022	.036	.048	.067	.052	.0564	.0342
pH-Field	7.8	7.7	7.7	7.7	7.7	7.6	7.5	7.5	7.4	7.8	7.7
pH-Lab											
Phosphate			0	.005	.0075	0	.0085	.008	.0053	0	.0075
Residue-Fliterable	62	65	49	46	60	50	53	54	48	53	56
Residue-Nonfilterable	0	0	0	0	0	0		0	8	0	0
Silica	3.35	2.95	2.45	2.35	2.4	1.85	2.7	2.88	2.7	2.8	2.94
Sulphate	2.03	1.25	2.2	2.1	3.89	1.9	2.3	2.1	2.4	2.1	1.8
Taste											
Temperature											
Turbidity										0	0
METALS											
Al-Aluminum										0	0
As-Arsenic										0	0
Ba-Barium										0	0
Ca-Calcium	13.3	11.8	12	11.3	11.4	12.3	11.9	11.3	11.2	11.4	11.4
Cd-Cadmium	0	0	0	0	0	0	0	0		0	0
Co-Cobalt										0	0
Cr-Chromium										0	0
Cu-Copper	0	0	0	0	0	0	0	0		0	0
Fe-Iron	.037	.028	.021	0	0	.044	.033	.05	.045	.026	.031
Hg-Mercury	0	0	0	0	0	0	0	0		0	0
K—Potassium	.168	.138	.105	.108	.114	.123	.118	.122	.133	.123	.131
Mg-Magnesium	1.73	1.71	1.54	1.57	1.55	1.68	1.3	1.48	1.52	1.52	1.51
Mn-Manganese										.0045	.006
Mo-Molybdenum										0	0
Na-Sodium	1.65	1.4	1.36	1.03	.95	1.08	1.07	1.56	1.09	1.04	1.1
Ni-Nickel										0	0
P—Phosphorus										0	0
Pb-Lead	0	0	0	0	0	0	0	0		0	0
Sb-Antimony										0	0
Se-Selenium										0	0
Si-Silicon										2.89	2.88
Sn-Tin										1.1	0
Sr-Strontium										.0183	.0193
Ti-Titanium										0	0
V—Vanadium										0	0
Zn-Zinc	0	0	0	0	0	0	0	0		0	0

WATER QUALITY VALUES FOR BIG QUALICUM; MUNDIE CHANNEL
(below detection limits = 0)

PARAMETERS	JUN18/79 CHANNEL ENTRANCE	JUL09/79 CHANNEL ENTRANCE	JUL30/79 CHANNEL ENTRANCE	AUG20/79 CHANNEL ENTRANCE	SEP11/79 CHANNEL ENTRANCE	OCT04/79 CHANNEL ENTRANCE	APR04/80 CHANNEL ENTRANCE	APR20/80 CHANNEL ENTRANCE	APR20/80 CHANNEL ENTRANCE	MAY26/80 CHANNEL ENTRANCE	MAY27/80 CHANNEL ENTRANCE
Alkalinity	37.3	36.9	37	37.2	73.2		27	27		34	31.5
Ammonia	.0095	.007	.006	.0068	.0065		0	63.5		.014	.0062
CO2											
Chloride	1.4	1.55	1.35	1.3	1.45		1.4	1.8		1.44	1.29
Color											
Conductivity Field											
Conductivity Lab	84.5	84.2	83.3	84.2	84		63.5	66.8		78	73.5
Dissolved O2-ppm											
Dissolved O2-%sat				0							
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	42.7	37.5	37.8	38.7	37.8	39.8	29.4	29.7	29.7	44	35.4
Nitrite	0	0	0	0	0	0	0	0		0	0
Nitrate	.028	.042	.0352	.032	.0455	0	.07	.08	.04	.047	.0808
pH-Field	7.7	7.9	7.7	7.7	7.8	0	7.8	7.5		7.8	7.8
pH-Lab											
Phosphate	.0113	.01	.0086	.0095	.0062	0	0	0	0	.012	.0078
Residue-Fliterable	64	59	56	67	60	0	47	44		51	51
Residue-Nonfilterable	0	0	0	0	0	0	0	0		0	0
Silica	3.5	3.4	3.45	3.53	3.62	0	2.3	1.9		3.41	2.74
Sulphate	1.8	2	1.7	2.1	2.3	0	2.2	2.7		2.7	2.5
Taste											
Temperature											
Turbidity	0	0	0	0	0						0
METALS											
Al-Aluminum	0	0	0	0	0						0
As-Arsenic	0	0	0	0	0						0
Ba-Barium	0	0	0	0	0	0					0
Ca-Calcium	14.2	11.5	11.7	12.2	12	13.2	9.8	9.9	10.4	12.94	11.9
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0						0
Cr-Chromium	0	0	0	0	0						0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.027	.037	.031	.027	.031	.022	.011	.014	.011	.0489	.027
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K—Potassium	.175	.159	.185	.174	.186	.112	.07	.68	.68	.18	.127
Mg-Magnesium	1.76	2.14	2.03	1.85	1.85	1.65	1.2	1.2	1.2	1.61	1.38
Mn-Manganese	.0052		.0062	.0052	.0071		.003	.003	.002	.007	.0068
Mo-Molybdenum	0		0	0	0						0
Na-Sodium	1.27	1.48	1.4	1.63	1.39	1.33	1.1	1	1	1.69	1.21
Ni-Nickel	3.07	0	0	0	0						0
P--Phosphorus	0	0	0	0	0						0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0						0
Se-Selenium	0	0	0	0	0						0
Si-Silicon	3.07	3.38	3.41	3.38	3.28						2.67
Sn-Tin		0	0	0	.0071						0
Sr-Strontium	.0208	.02	.0208	.0211	.0208						.0172
Ti-Titanium	0	0	0	0	0						0
V—Vanadium	0	0	0	0	0						0
Zn-Zinc	0	0	0	0	0	0	0	0	0	.0459	0

WATER QUALITY VALUES FOR BIG QUALICUM; MUNDIE CHANNEL
(below detection limits = 0)

PARAMETERS	JUN10/80 CHANNEL ENTRANCE	JUN10/80 CHANNEL ENTRANCE	JUN26/80 CHANNEL ENTRANCE	JUL18/80 CHANNEL ENTRANCE	JUL30/80 CHANNEL ENTRANCE
Alkalinity	29.5		33		37.2
Ammonia	0		.0065		.0102
CO2					
Chloride	1.5		1.08		2.06
Color					
Conductivity Field					
Conductivity Lab	87		74	78.5	
Dissolved O2-ppm					
Dissolved O2-%sat					
Dissolved Gas Tot					
Dissolved Nitrogen					
Hardness	31.1	31	32.8		37.1
Nitrite	0		0		0
Nitrate			.081		.088
pH-Field	7.7		7.8		7.5
pH-Lab					
Phosphate	0		.0077		.0083
Residue-Filterable	54		51		54
Residue-Nonfilterable	0		0		0
Silica	2.3		3.15		3.07
Sulphate	3.3		3.06		2
Taste					
Temperature					8.3
Turbidity			0		0
METALS					
Al-Aluminum			0		0
As-Arsenic			0		0
Ba-Barium			.0061		0
Ca-Calcium	10.4	10.4	10.6		12.3
Cd-Cadmium	0	0	0		0
Co-Cobalt			0		0
Cr-Chromium			0		0
Cu-Copper	0	0	0		0
Fe-Iron	.009	.009	.037		.027
Hg-Mercury	0	0	0		0
K--Potassium	.07	.07	.124		.148
Mg-Magnesium	1.2	1.2	1.53		1.58
Mn-Manganese	.001	.001	.0068		.0079
Mo-Molybdenum			0		0
Na-Sodium	1.2	1.1	1.16		1.39
Ni-Nickel			0		0
P--Phosphorus			0		0
Pb-Lead	0	0	0		0
Sb-Antimony			0		0
Se-Selenium			0		0
Si-Silicon			3.03		2.97
Sn-Tin			0		0
Sr-Strontium			.017		.0188
Ti-Titanium			0		0
V--Vanadium			0		0
Zn-Zinc	.006	.01	0	0	0

BIG QUALICUM RIVER 1968

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	9.72	15	12.47	31
NOVEMBER	6.67	10	8.6	30
DECEMBER	.83	7.22	4.69	30

BIG QUALICUM RIVER 1969

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.56	3.89	2.29	31
FEBRUARY	1.67	4.44	2.8	28
MARCH	2.5	7.5	4.67	31
APRIL	4.72	9.44	6.87	30
MAY	6.39	12.22	9.22	27
JUNE	6.94	11.67	8.82	30
JULY	8.06	11.67	9.51	23
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	10.56	12.78	11.62	17
NOVEMBER	8.61	11.39	9.77	30
DECEMBER	6.67	8.89	7.86	31

BIG QUALICUM RIVER 1970

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	4.44	7.22	5.35	31
FEBRUARY	4.44	5.56	4.89	28
MARCH	4.44	7.22	5.81	31
APRIL	5.83	9.72	7.7	29
MAY	9.44	14.17	11.46	26
JUNE	11.11	17.78	14.69	16
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER	6.94	9.44	8.09	13
DECEMBER	3.89	6.94	5.33	31

BIG QUALICUM RIVER 1971

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.78	3.89	3.45	31
FEBRUARY	3.33	4.44	3.86	28
MARCH	3.33	4.44	3.82	31
APRIL	4.17	7.78	5.58	30
MAY	6.11	8.61	6.95	31
JUNE	7.22	8.33	7.48	23
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	10.28	12.78	11.74	27
NOVEMBER	7.22	10.28	8.76	30
DECEMBER	3.61	7.78	5.45	31

BIG QUALICUM RIVER 1972

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	1.67	3.89	2.9	31
FEBRUARY	1.67	3.06	2.48	28
MARCH	2.78	5.56	3.95	30
APRIL	5	6.94	5.94	30
MAY	6.39	13.89	9.59	31
JUNE	9.44	13.33	11.53	21
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	10.28	12.22	11.47	21
NOVEMBER	7.22	10.56	8.97	30
DECEMBER	4.44	7.78	5.17	31

BIG QUALICUM RIVER 1973

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.5	4.44	3.3	31
FEBRUARY	2.22	3.33	2.84	28
MARCH	3.33	5.28	3.99	31
APRIL	4.72	8.06	6.3	30
MAY	6.94	13.61	9.87	31
JUNE	11.67	15	13.66	27
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	10.56	12.22	11.31	22
NOVEMBER	6.11	10.56	7.96	30
DECEMBER	4.44	6.11	5.34	24

BIG QUALICUM RIVER 1974

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.78	4.44	3.54	31
FEBRUARY	3.33	3.89	3.42	28
MARCH	2.78	4.72	3.65	31
APRIL	4.44	8.33	5.78	30
MAY	6.67	9.17	7.93	31
JUNE	8.33	9.17	8.75	5
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	11.39	13.06	12.04	16
NOVEMBER	7.78	11.94	9.63	30
DECEMBER	5.28	7.78	6.62	31

BIG QUALICUM RIVER 1975

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.06	5	3.97	31
FEBRUARY	1.94	3.33	2.63	28
MARCH	2.78	4.44	3.35	31
APRIL	3.89	7.22	5.58	30
MAY	6.67	8.89	7.58	13
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	10.28	13.33	11.95	31
NOVEMBER	6.39	10.56	8.38	30
DECEMBER	4.44	6.67	5.29	31

BIG QUALICUM RIVER 1976

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.33	4.44	3.96	31
FEBRUARY	2.78	3.89	3.52	28
MARCH	2.78	3.89	3.49	31
APRIL	3.61	8.33	5.45	30
MAY	6.67	8.89	8.19	5
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	10	11.67	10.75	19
NOVEMBER	7.78	10.56	9.54	30
DECEMBER	6.39	7.78	7.16	31

BIG QUALICUM RIVER 1977

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	4.44	6.39	5.19	31
FEBRUARY	4.44	5.56	4.81	28
MARCH	4.44	5.56	5.05	31
APRIL	3.06	6.11	3.75	25
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	10.56	13.33	11.95	13
NOVEMBER	6.11	11.11	8.32	29
DECEMBER	3.89	6.67	5.11	31

BIG QUALICUM RIVER 1978

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.06	3.89	3.3	31
FEBRUARY	2.78	4.44	3.33	28
MARCH	4.17	7.5	5.34	31
APRIL	6.39	9.44	7.77	30
MAY	8.89	13.89	11.51	31
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	11.5	12.5	11.96	28
NOVEMBER	7.5	11.5	9.45	30
DECEMBER	4	7.5	6.06	31

BIG QUALICUM RIVER 1979

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.5	4	3.01	31
FEBRUARY	2	3	2.54	28
MARCH	2.5	5.5	4.01	31
APRIL	5	10.5	6.7	28
MAY	9.5	15	12.13	31
JUNE	14	18	15.63	13
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	11.5	13	12.29	29
NOVEMBER	8.5	12	10.21	30
DECEMBER	6	8.5	7.18	31

BIG QUALICUM RIVER 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3	6	4.64	31
FEBRUARY	3	4	3.41	28
MARCH	4	5.5	4.42	31
APRIL	5	8	6.52	30
MAY	7.5	10.5	8.87	31
JUNE	8	15	10.22	30
JULY	9	13.5	2.7	16
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	-	-	12.72	22
NOVEMBER	-	-	10.85	30
DECEMBER	-	-	7.2	31

BIG QUALICUM RIVER 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	6.58	31
FEBRUARY	-	-	5.92	28
MARCH	-	-	6.62	31
APRIL	-	-	8.15	30
MAY	-	-	9.59	29
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	11.7	12.8	12.38	18
NOVEMBER	8.8	11.9	10.46	30
DECEMBER	5	9	7.11	31

BIG QUALICUM RIVER 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.9	5.7	4.44	31
FEBRUARY	3.8	4.3	3.99	28
MARCH	3.8	5.6	4.61	31
APRIL	5.4	9.2	6.55	30
MAY	8	13	10.24	31
JUNE	11.8	14.6	13.33	8
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	11	13.5	11.76	19
NOVEMBER	8	11.6	9.55	30
DECEMBER	5.3	8	6.7	31

BIG QUALICUM RIVER 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	5.1	5.5	5.31	31
FEBRUARY	4.8	5.6	5.18	28
MARCH	5.3	6.8	5.88	31
APRIL	6.5	11.7	8.12	30
MAY	9.2	16.8	11.39	31
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	10.1	13.3	11.54	22
NOVEMBER	8.4	12.1	10.15	30
DECEMBER	4.2	8.4	6.33	31

BIG QUALICUM RIVER 1984

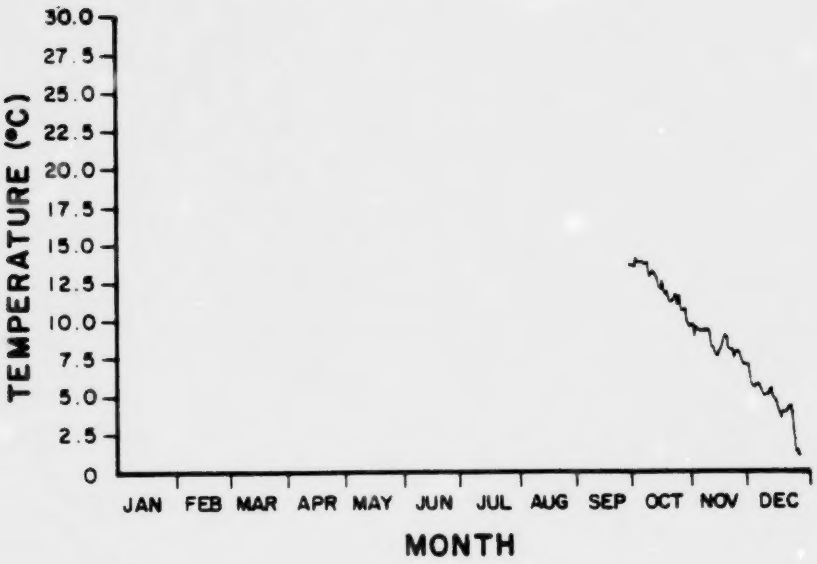
MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	4	4.7	4.4	31
FEBRUARY	4.4	5.7	4.82	28
MARCH	4.6	6.4	5.5	31
APRIL	6	8	7.22	30
MAY	7.6	10.3	8.29	31
JUNE	8.5	9.7	9.04	26
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	10.5	13.4	12.07	22
NOVEMBER	7	10.5	8.7	30
DECEMBER	3.9	7	5.56	31

BIG QUALICUM RIVER 1985

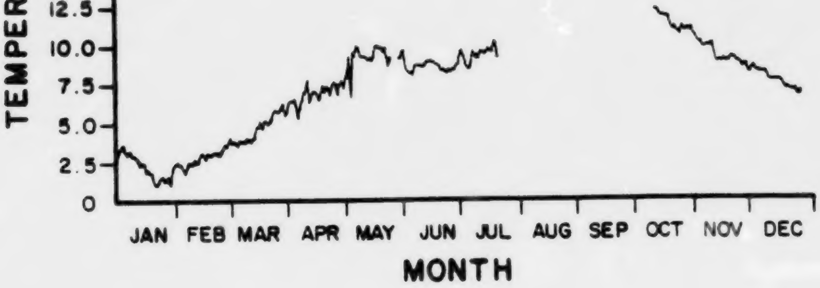
MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.6	4	3.78	31
FEBRUARY	2.9	3.9	3.35	28
MARCH	3.9	5.3	4.39	31
APRIL	5.1	8.2	6.94	30
MAY	7.7	14.7	10.66	31
JUNE	14	16.3	15.07	11
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	11.3	15.1	13.21	30
NOVEMBER	5.6	11.5	8.94	30
DECEMBER	3.5	5.6	4.57	31

BIG QUALICUM RIVER 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.9	4.8	4.29	31
FEBRUARY	3.4	4.7	4.13	28
MARCH	4.2	4.7	4.39	4
APRIL	NO DATA			
MAY	NO DATA			
JUNE	NO DATA			
JULY	NO DATA			
AUGUST	NO DATA			
SEPTEMBER	NO DATA			
OCTOBER	NO DATA			
NOVEMBER	NO DATA			
DECEMBER	NO DATA			



Big Qualicum River 1968



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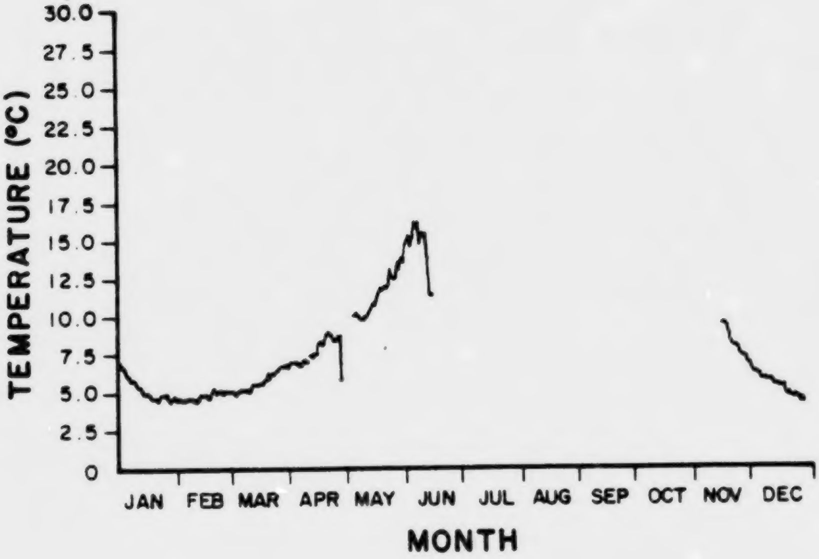

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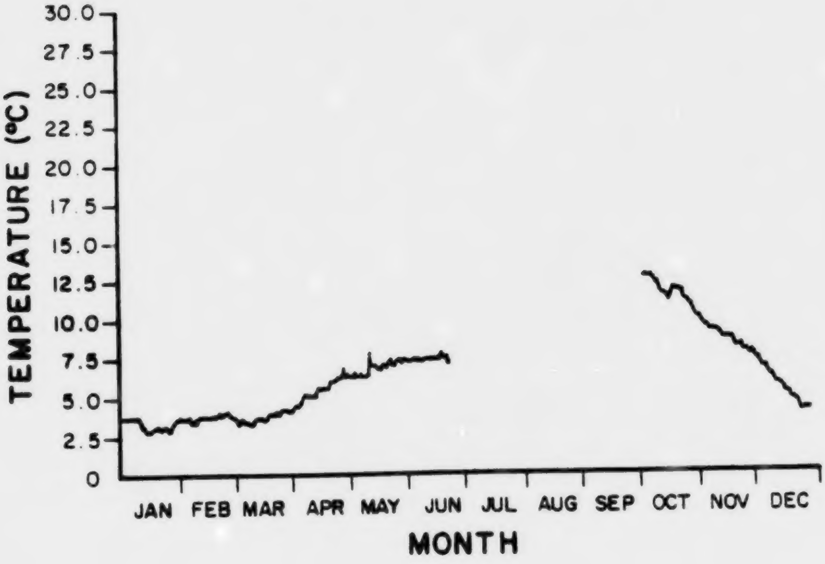
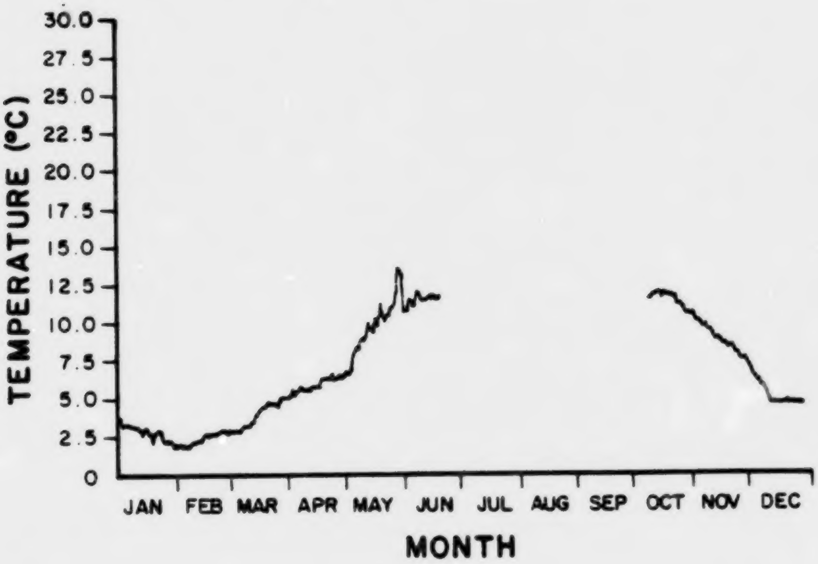


Big Qualicum River 1971

Big Qualicum River 1972



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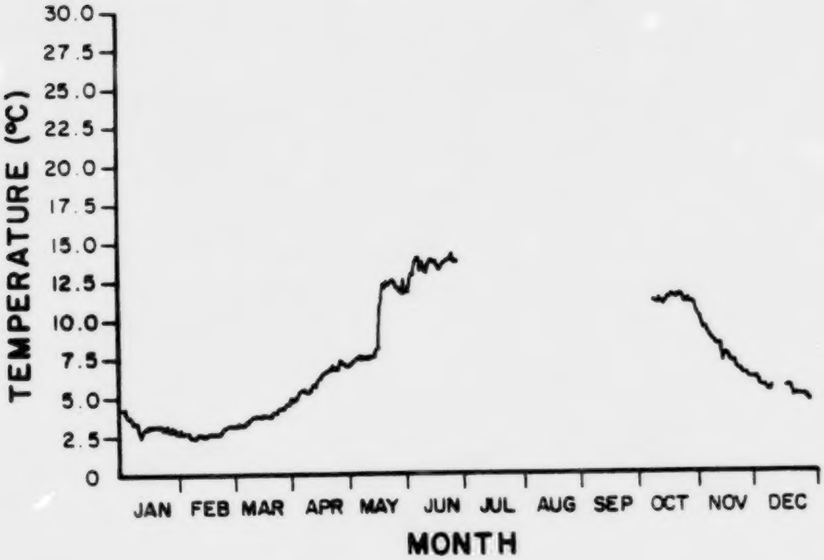

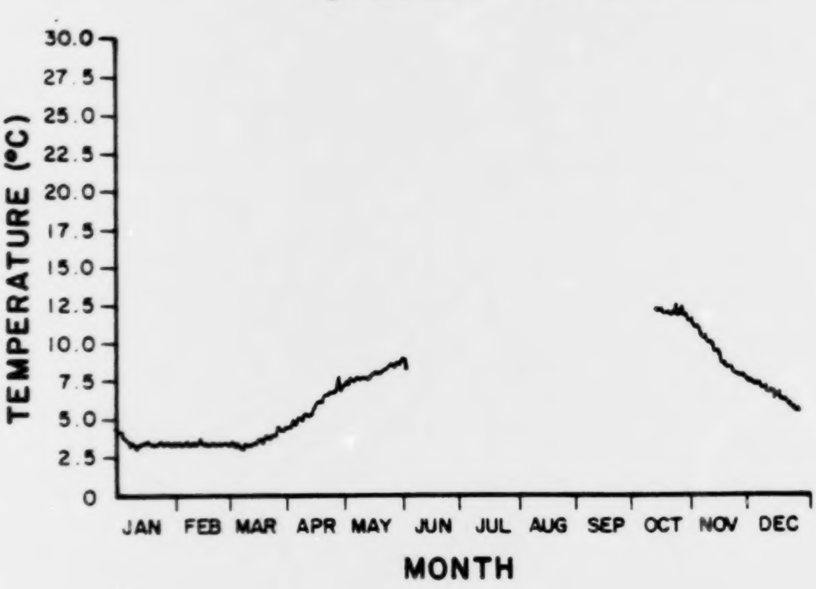
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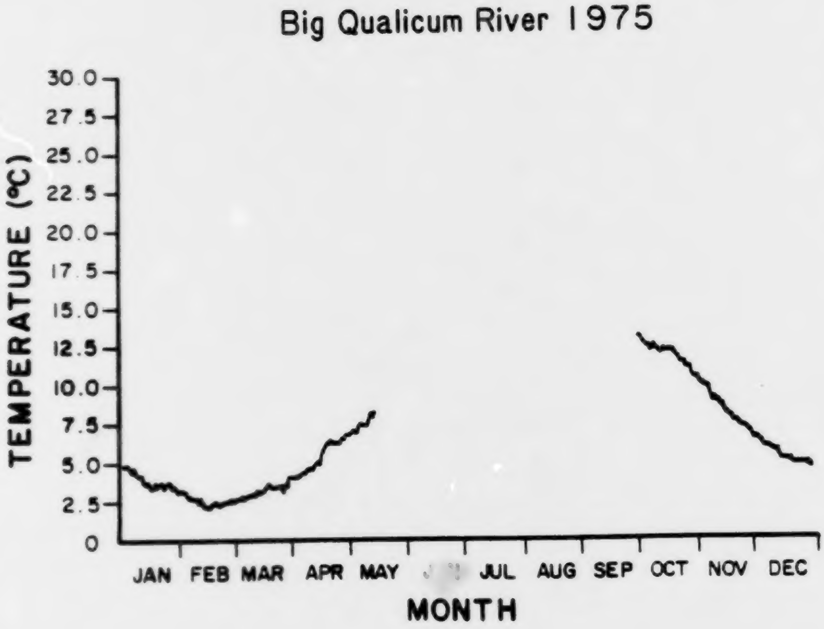
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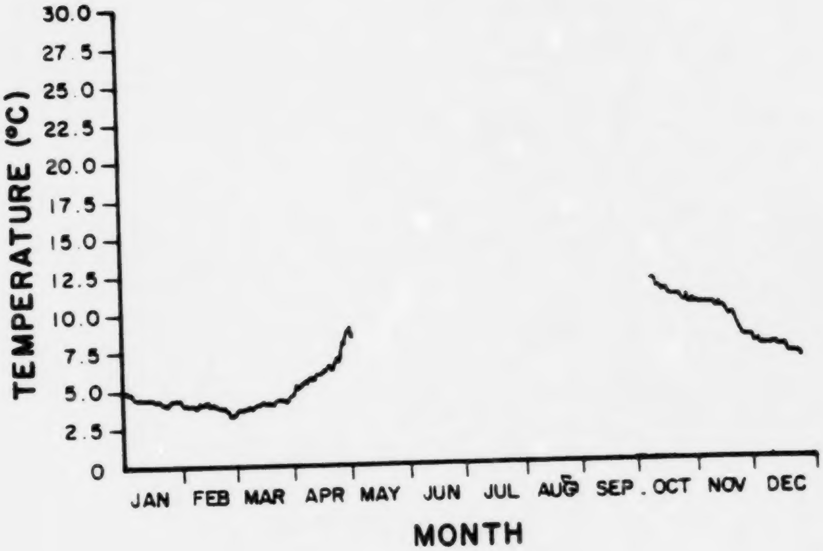

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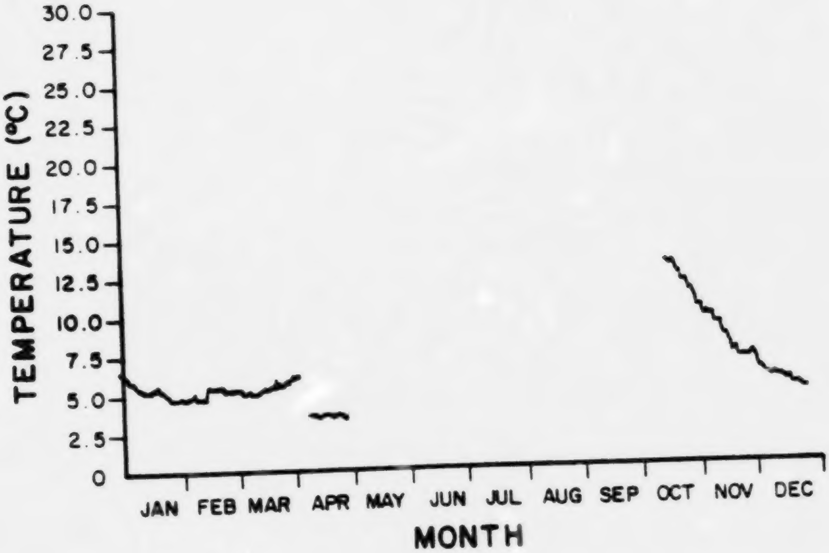

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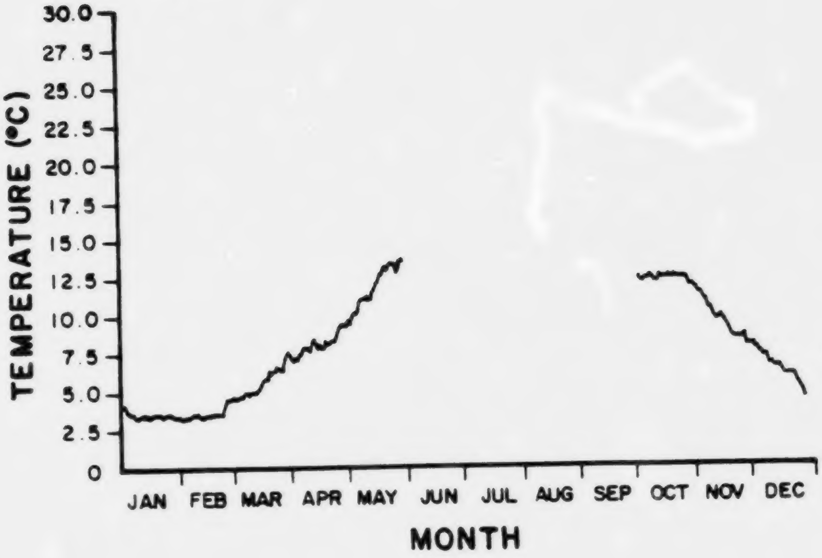

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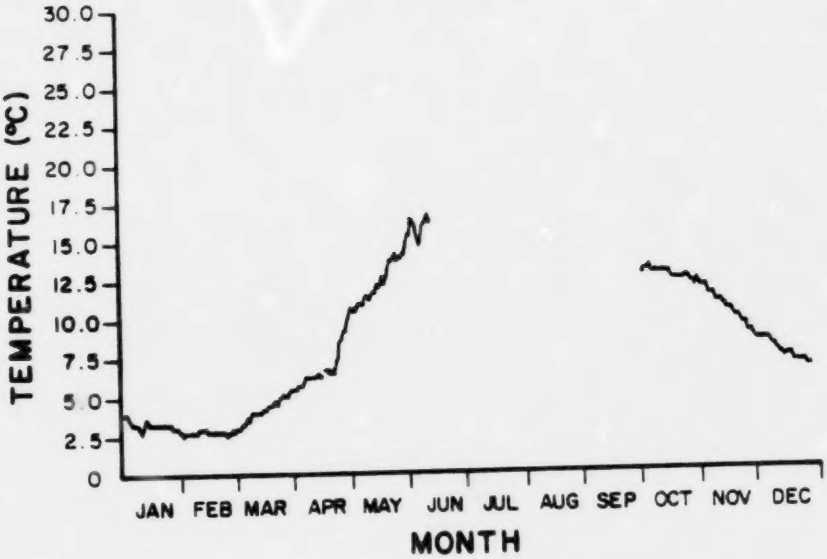

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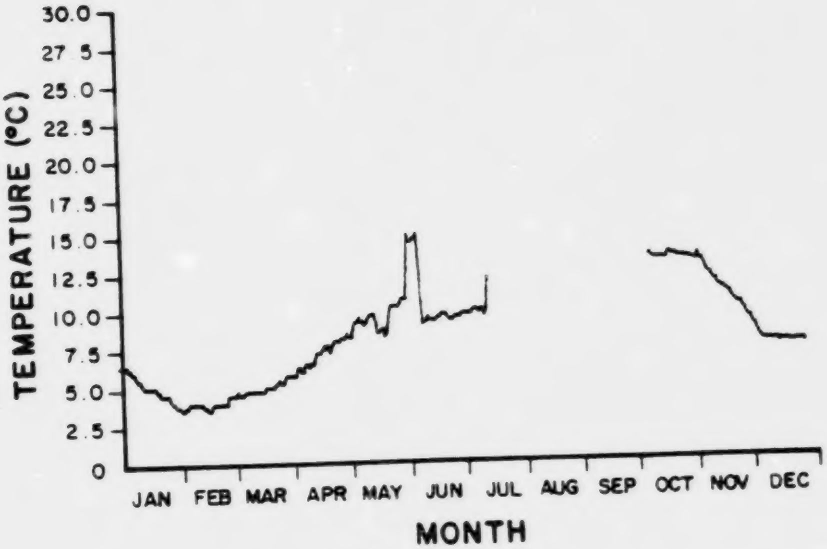

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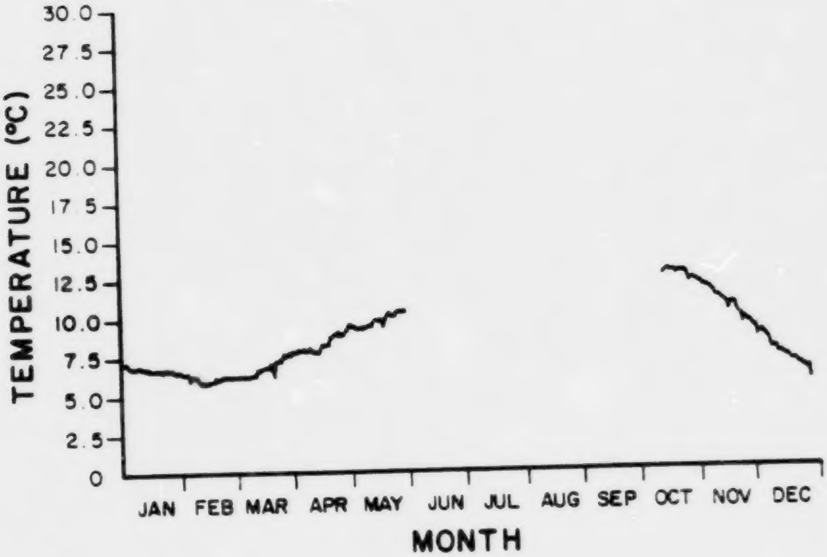

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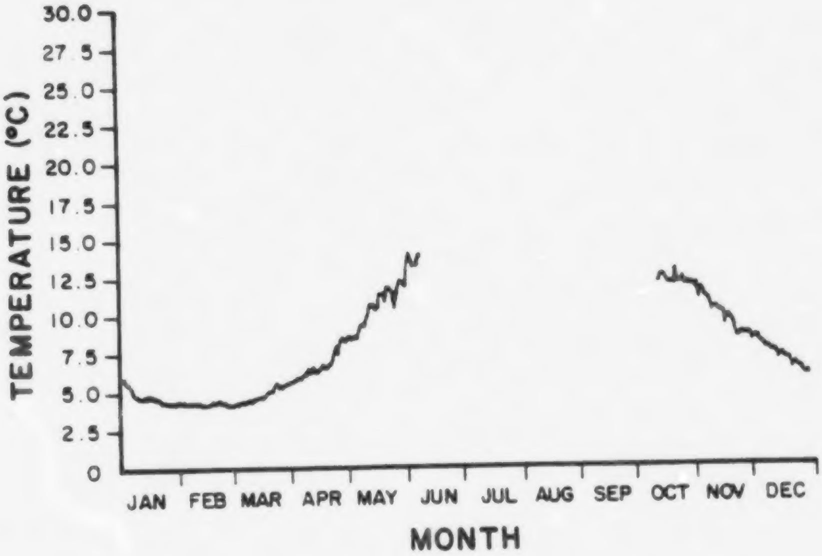

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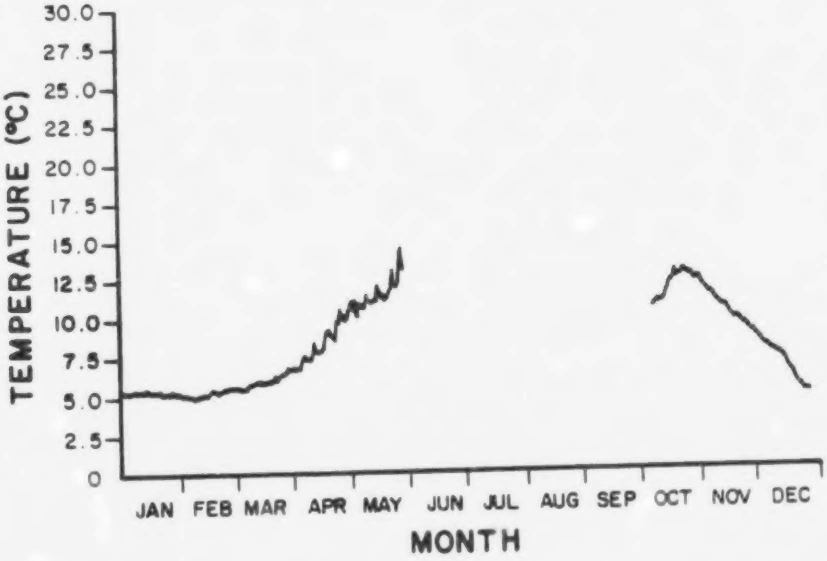

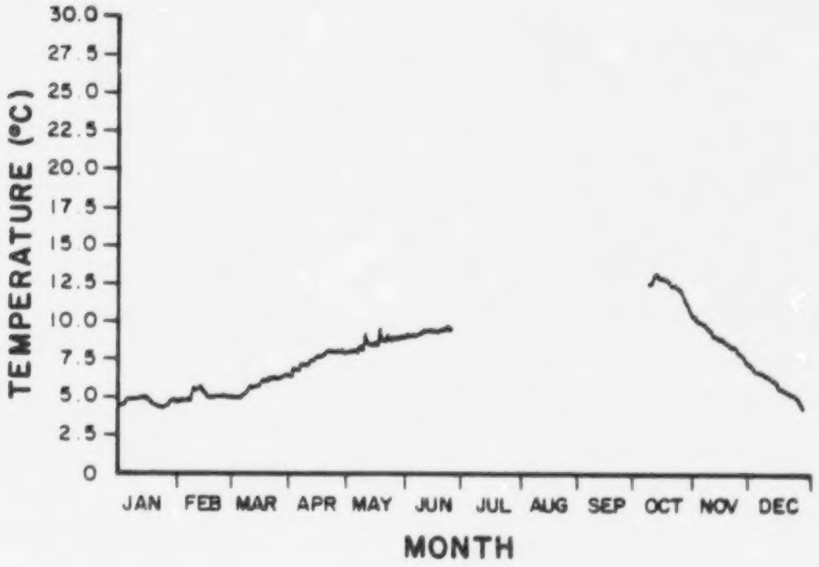

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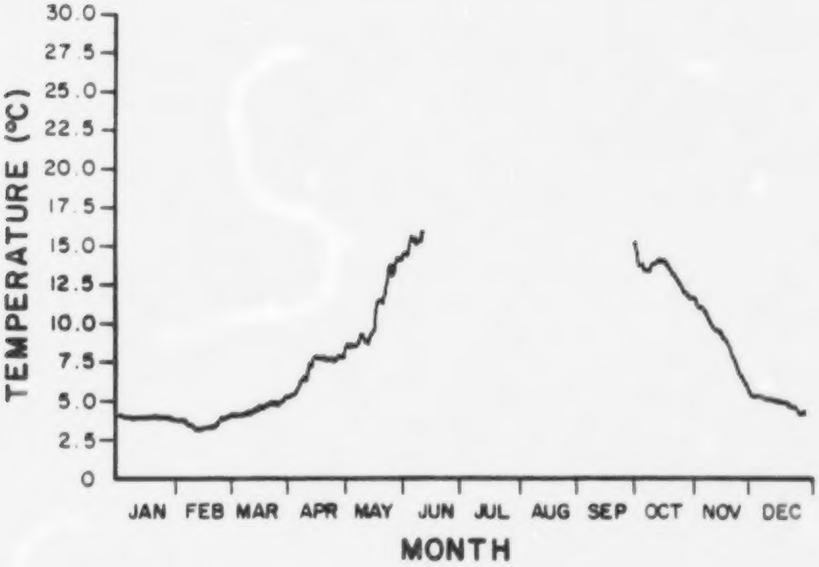
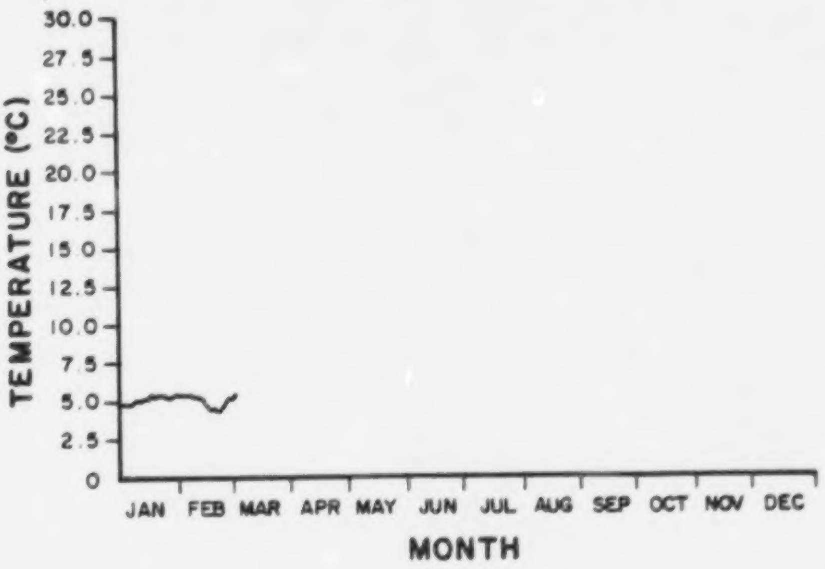


Big Qualicum River 1985

Big Qualicum River 1986



Facility: BIRKENHEAD

Location:

Located 2 km north of Mount Currie on the east bank of the Birkenhead River, approximately 130 km north of Vancouver.

Description:

First year of production was in 1976, as an incubation facility only. This facility was built on a pilot scale, to try to increase Birkenhead chinook stock. Construction of rearing and holding ponds was completed by 1979.

Egg production targets in 1985 were 40 K coho and 250 K chinook. Eggs are obtained from the Birkenhead River. Some eggs from Birkenhead chinook stock are transported to Inch Creek hatchery for incubation and rearing. Juveniles are released to the Birkenhead River.

Water Sources:

Surface. The Birkenhead River is used as a backup water supply for the hatchery. The gravity-feed setup can supply 227 lpm.

Groundwater. There are two wells on site. Only one has had a pump installed; it produces 2,834 lpm, and is used as the primary hatchery water supply.

General Water Quality:

Good water quality, although the temperature is lower than desirable for the raising of chinook and steelhead. There is no temperature control.

Special Notes:

The groundwater temperature has been a fairly constant 7.5°C year-round, and no tables or graphs for the well are included. Although the hatchery did not begin operations until 1976, temperatures for Birkenhead River were taken from 1964 to 1981, after which records were not kept as the river water is seldom used.

WATER QUALITY VALUES FOR BIRKENHEAD
[below detection limits = 0]

PARAMETERS	FEB16/76 BIRKENHEAD (BKHD) RIVER	FEB16/76 BKHD RIVER	FEB16/76 BKHD RIVER	MAR25/76 BKHD RIVER	MAR25/76 BKHD RIVER	MAR25/76 BKHD RIVER	MAY21/76 BKHD RIVER	MAY21/76 BKHD RIVER	MAY21/76 BKHD RIVER	NOV09/79 BKHD RIVER	APR14/81 BKHD RIVER
Alkalinity	25.1	50.3	24.1	21	23	16	20	15	21	19.5	26.9
Ammonia	0	0	0	0	0	0	.007	0	0	0	0
CO2											
Chloride	.7	.9	.8	.5	0	.5	.6	0	0	1.82	.76
Color											
Conductivity Field											
Conductivity Lab	79	69	76	83	72	75	55	54	41	57.8	84.5
Dissolved O2-ppm				12.9	13.3	12.5	11.7	1.7		7.4	
Dissolved O2-%sat											
Dissolved Gas Tot										95	
Dissolved Nitrogen										104	
Hardness	34	32	30	34	29	31				25.3	35.8
Nitrite	0	0	0	0	0	0	.008	.008	.008	0	0
Nitrate	.038	.041	.039	33	.05	.042	.07	.05	.07	.065	.0378
pH-Field										6.5	
pH-Lab	7.5	7.6	7.5	7.4	6.9	7.6	7.5	7.3	7.5	7.3	7.7
Phosphate	0	0	0	0	0	0	0	0	0	.165	.006
Residue-Filterable	65	54	58	60	54	50	43	37	41	46	59
Residue-Nonfilterable	0	0	0	0	0	0	0	0	0	0	0
Silica	5.2	3.1	3	3.2	3.9	9				2.7	6.23
Sulphate	10	10	9	11	13	8.8	6	5.4	6	8.5	11.3
Taste											
Temperature										6	
Turbidity							.48	.43	.73	0	0
METALS											
Al-Aluminum										0	.087
As-Arsenic										0	0
Ba-Barium										.0047	.0074
Ca-Calcium	12	2	11	12	11	11	9	7.5	8.5	8.85	12.84
Cd-Cadmium										0	0
Co-Cobalt										0	0
Cr-Chromium										*.165	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.1	.05	.07	0	0	0	0	.05	.03	.029	.033
Hg-Mercury										0	0
K—Potassium	.54	.1	.58	.51	.09	.61	.57	.14	.54	.8	.06
Mg-Magnesium	.97	.41	.94	.96	.39	98	.8	.27	.73	.767	1.04
Mn-Manganese	0	0	0	0	0	0	0	0	0	0	.0015
Mo-Molybdenum										0	0
Na-Sodium	1.2	.8	1.1	1.2	.9	1.2	1.2	.85	.9	.95	1.5
Ni-Nickel										0	0
P—Phosphorus										0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony										0	0
Se-Selenium										0	0
Si-Silicon										2.7	3.35
Sn-Tin										0	0
Sr-Strontium										.0248	.0366
Ti-Titanium										0	0
V—Vanadium										0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR BIRKENHEAD
(below detection limits = 0)

	JAN18/83	NOV08/78	NOV15/78	APR03/79	APR14/81	JAN08/82	MAY18/82
	BIRKENHEAD						
PARAMETERS (BKHD)	RIVER	WELL	WELL	WELL	WELL	WELL	WELL
Alkalinity	28	23.5	20.6	27.4	33.7	33.8	32
Ammonia	0	0	0	.01	0	0	0
CO2							
Chloride	0	1.82	2.77	3.19	3.06	3.05	3.3
Color							
Conductivity Field							
Conductivity Lab	158	184	510	202	203	170	212.9
Dissolved O2-ppm		13.8	6.1	8.5			
Dissolved O2-%sat							
Dissolved Gas Tot							
Dissolved Nitrogen							
Hardness	64.4	76.8		88.3	82.4		88.7
Nitrite	0	0	0	0	0	.0071	0
Nitrate	.08	.041	.035	.0742	.0417	.053	.06
pH-Field		6.5					
pH-Lab	7.1	0	8.8	7.2	7.2	7.2	7
Phosphate	.006	0	0	.009	.0074	0	.009
Residue-Filterable	111	132	400	146	136	114	148
Residue-Nonfilterable	0	0	0	0	0	0	0
Silica		5.82	5.8	6.55	6.1	5.76	6
Sulphate	38.3	28	220	54.7	51	36.6	57
Taste							
Temperature							
Turbidity		0	0	0		0	0
METALS							
Al-Aluminum		0	0	0	0	0	0
As-Arsenic				0	0	0	0
Ba-Barium	.005	.0055	.0098	.009	.0067	.006	.007
Ca-Calcium	23.5	28	92.6	31.7	30	24	32.1
Cd-Cadmium	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0
Cr-Chromium	0	*.122	0	0	0	0	0
Cu-Copper	0	0	0	.0026	.0013	0	.001
Fe-Iron	.021	.027	0	.064	.0072	0	.007
Hg-Mercury	0	0	0	0	0	0	0
K--Potassium	71	.905	.604	.884	.846	.78	.91
Mg-Magnesium	1.4	1.88	3.58	1.2	183	1.59	2
Mn-Manganese	0	0	0	.0082	0	0	0
Mo-Molybdenum	0	0	0	0	0	0	0
Na-Sodium	2.8	2.26	3.08	2.21	3.91	3.52	3.6
Ni-Nickel	0	0	0	0	0	0	0
P--Phosphorus	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0
Si-Silicon	5.3	5.87	7.98	6.38	5.75	5.78	6
Sn-Tin	0	0	0	0	0	0	0
Sr-Strontium	.068	.121	.4	.13	.124	.102	.135
Ti-Titanium	0	0	0	0	0	.0085	0
V--Vanadium	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	.0226	.0014	.0053	.003

BIRKENHEAD RIVER 1964

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY	4.72	11.67	7.55	31
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER	0	7.22	4.02	30
DECEMBER	0	4.44	1.63	31

BIRKENHEAD RIVER 1965

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	3.06	1.45	31
FEBRUARY	.28	4.17	2.31	27
MARCH	.56	6.39	3.02	31
APRIL	2.5	8.89	5.44	30
MAY	3.89	10	6.51	31
JUNE	6.39	13.89	9.13	30
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER	1.67	7.22	4.83	30
DECEMBER	0	4.72	2.49	29

BIRKENHEAD RIVER 1966

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	3.33	1.22	31
FEBRUARY	.28	4.44	2.67	28
MARCH	.28	6.67	3.62	31
APRIL	2.5	9.17	4.97	24
MAY	4.17	10	6.69	28
JUNE	5.83	11.39	8.07	30
JULY	7.78	14.17	10.4	31
AUGUST	9.44	16.11	12.43	30
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER	1.11	7.22	4.19	26
DECEMBER	.28	4.44	1.77	24

BIRKENHEAD RIVER 1967

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.28	3.33	1.93	31
FEBRUARY	1.11	5	3.1	28
MARCH	.83	6.67	3.96	27
APRIL	2.78	10	6.16	30
MAY	4.44	10.56	6.93	31
JUNE	5.56	10.83	7.97	30
JULY	7.78	15	11.06	31
AUGUST	10.83	17.22	14.24	19
SEPTEMBER	9.44	14.44	12.09	29
OCTOBER	5.28	11.11	7.91	26
NOVEMBER	2.22	6.11	4.78	30
DECEMBER	-.28	4.44	2.35	31

BIRKENHEAD RIVER 1968

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.28	3.61	1.4	31
FEBRUARY	.56	5.56	3.06	28
MARCH	2.78	6.94	4.46	31
APRIL	3.06	11.11	6.17	17
MAY	4.44	10.56	7.02	31
JUNE	5.56	11.39	8.02	30
JULY	8.33	14.17	10.56	31
AUGUST	10.28	15	12.24	31
SEPTEMBER	7.78	14.17	11.13	30
OCTOBER	5.28	10.56	7.28	31
NOVEMBER	2.78	6.11	4.67	30
DECEMBER	0	9.44	2.09	29

BIRKENHEAD RIVER 1969

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	1.39	.19	29
FEBRUARY	0	3.06	1.58	27
MARCH	2.22	5.28	3.62	31
APRIL	3.33	7.22	5.62	30
MAY	5	8.89	6.87	31
JUNE	6.11	11.67	9.07	30
JULY	8.89	15.56	12.12	31
AUGUST	9.44	15.28	12.27	23
SEPTEMBER	9.44	14.72	11.24	26
OCTOBER	5.83	11.11	8.07	30
NOVEMBER	4.44	8.89	6.31	24
DECEMBER	1.11	5.83	3.76	31

BIRKENHEAD RIVER 1970

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	2.78	1.03	18
FEBRUARY	1.39	4.72	2.88	27
MARCH	0	7.78	4.07	30
APRIL	3.33	10	5.8	30
MAY	3.89	11.11	6.98	31
JUNE	6.39	13.89	9.76	30
JULY	10	17.22	13.35	31
AUGUST	10.28	17.22	13.38	31
SEPTEMBER	7.22	14.44	10.55	30
OCTOBER	2.78	11.67	6.9	31
NOVEMBER	0	6.11	3.36	30
DECEMBER	0	3.33	1.29	26

BIRKENHEAD RIVER 1971

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	3.33	1.16	25
FEBRUARY	0	4.44	3.3	28
MARCH	0	9.72	3.44	31
APRIL	2.78	10	5.1	30
MAY	3.61	9.44	5.85	31
JUNE	5	10.56	7.16	30
JULY	6.11	16.67	10.68	31
AUGUST	10.56	16.67	13.25	31
SEPTEMBER	6.39	12.22	9.75	30
OCTOBER	2.22	11.94	7.66	31
NOVEMBER	2.5	6.39	4.66	30
DECEMBER	0	3.61	.78	23

BIRKENHEAD RIVER 1972

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	3.06	1.1	27
FEBRUARY	0	3.89	2.56	22
MARCH	.28	5.83	3.25	27
APRIL	2.78	8.06	4.87	22
MAY	4.44	10.56	6.9	23
JUNE	6.11	10.28	7.89	4
JULY	8.89	14.44	10.91	11
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	3.33	9.17	6.58	19
NOVEMBER	2.22	6.67	4.33	30
DECEMBER	0	4.44	1.61	31

BIRKENHEAD RIVER 1973

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	3.33	1.09	31
FEBRUARY	0	8.06	2.76	28
MARCH	2.5	7.78	4.34	31
APRIL	3.33	8.89	5.76	30
MAY	4.44	10	6.35	31
JUNE	5.56	10.56	7.52	30
JULY	8.89	14.44	10.93	11
AUGUST	9.44	16.11	12.29	31
SEPTEMBER	8.33	14.17	10.79	30
OCTOBER	5.56	10	7.45	31
NOVEMBER	0	6.39	3.17	30
DECEMBER	.56	3.89	2.86	31

BIRKENHEAD RIVER 1974

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	3.89	1.17	31
FEBRUARY	1.11	4.44	2.77	28
MARCH	.83	6.11	3.42	31
APRIL	3.06	8.06	5.19	30
MAY	3.89	9.44	6.13	31
JUNE	5	9.44	7.17	30
JULY	6.11	10.56	7.81	31
AUGUST	8.33	12.22	10.33	31
SEPTEMBER	7.78	12.22	10.36	30
OCTOBER	5.56	8.89	7.4	31
NOVEMBER	2.78	6.67	4.32	30
DECEMBER	1.67	4.44	3.24	31

BIRKENHEAD RIVER 1975

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	2.78	1.34	30
FEBRUARY	0	3.61	.34	25
MARCH	1.11	6.11	2.92	31
APRIL	2.22	7.78	4.61	30
MAY	3.89	10	6.46	31
JUNE	6.11	11.67	7.95	28
JULY	8.33	14.44	11.49	31
AUGUST	7.22	15	11.2	31
SEPTEMBER	6.67	11.67	8.75	30
OCTOBER	3.33	9.44	5.95	23
NOVEMBER	1.11	4.44	2.9	8
DECEMBER	.83	3.89	2.56	31

BIRKENHEAD RIVER 1976

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.56	3.33	2.19	31
FEBRUARY	.83	3.61	2.7	28
MARCH	0	6.11	3.07	31
APRIL	2.22	9.44	5.4	30
MAY	4.44	8.89	6.31	31
JUNE	5.56	11.11	7.57	30
JULY	6.67	12.78	8.73	31
AUGUST	8.89	13.33	10.93	31
SEPTEMBER	8.33	13.33	11.41	30
OCTOBER	5.56	11.67	8.83	31
NOVEMBER	2.22	8.33	5.35	30
DECEMBER	1.94	5.56	3.77	31

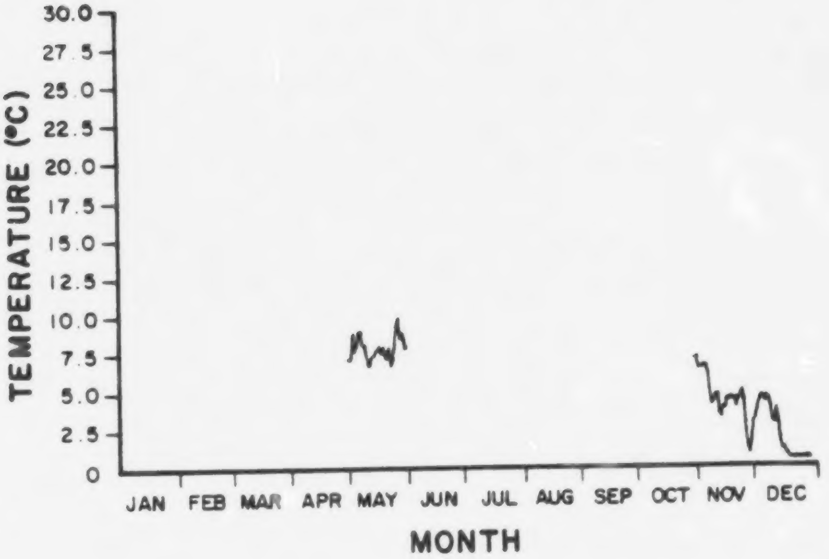
BIRKENHEAD RIVER 1978

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY	4.2	10	6.48	13
JUNE	4.7	10.6	7.34	30
JULY	6.7	24.2	10.74	31
AUGUST	8.1	29.4	12.61	31
SEPTEMBER	5.6	10.8	8.19	29
OCTOBER	3.3	8.9	5.99	31
NOVEMBER	0	5.6	1.85	30
DECEMBER	-.6	2.2	.91	31

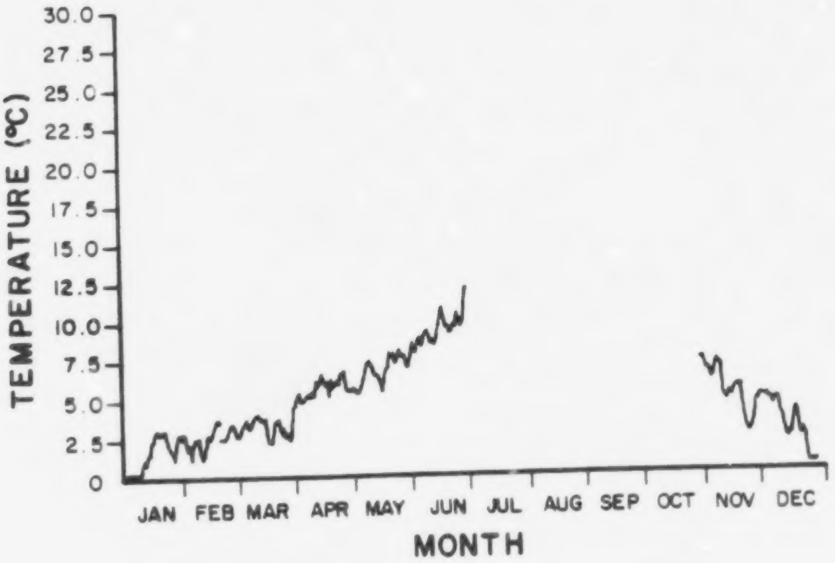
BIRKENHEAD RIVER 1979

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	1.1	.2	31
FEBRUARY	0	2.8	1.03	22
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

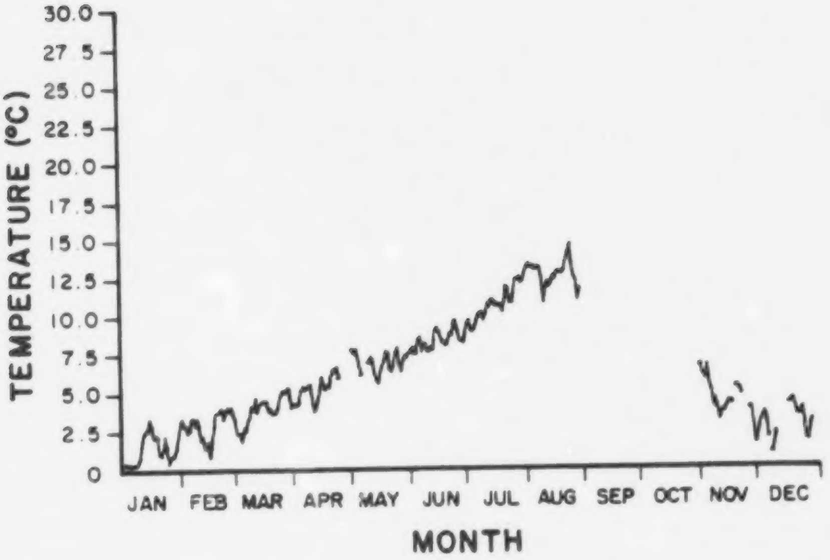
Birkenhead River 1964



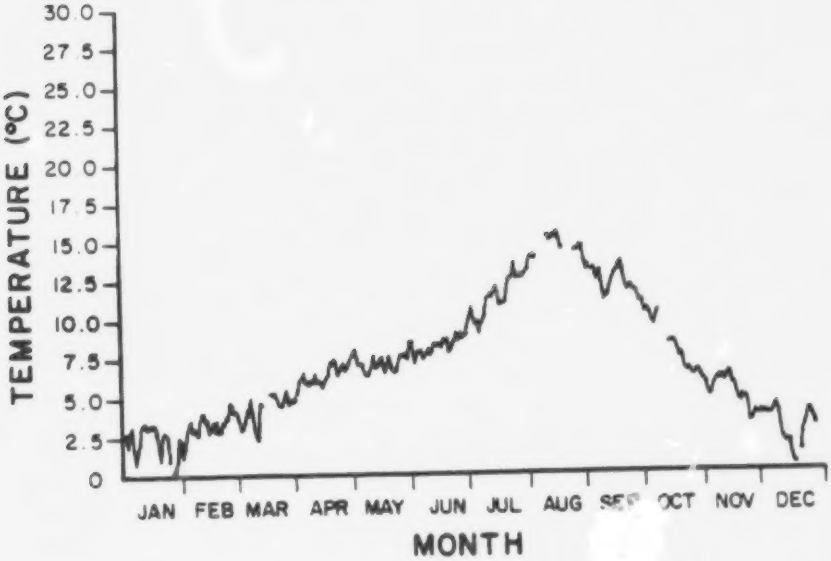
Birkenhead River 1965



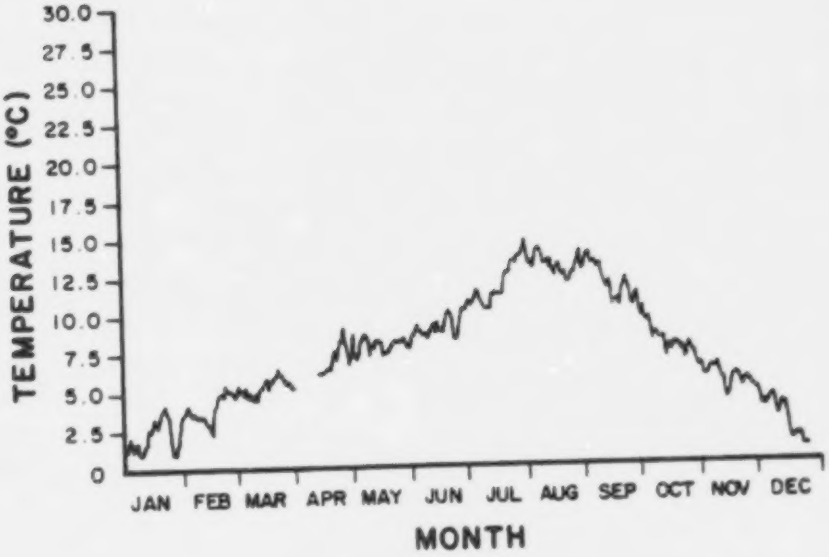
Birkenhead River 1966



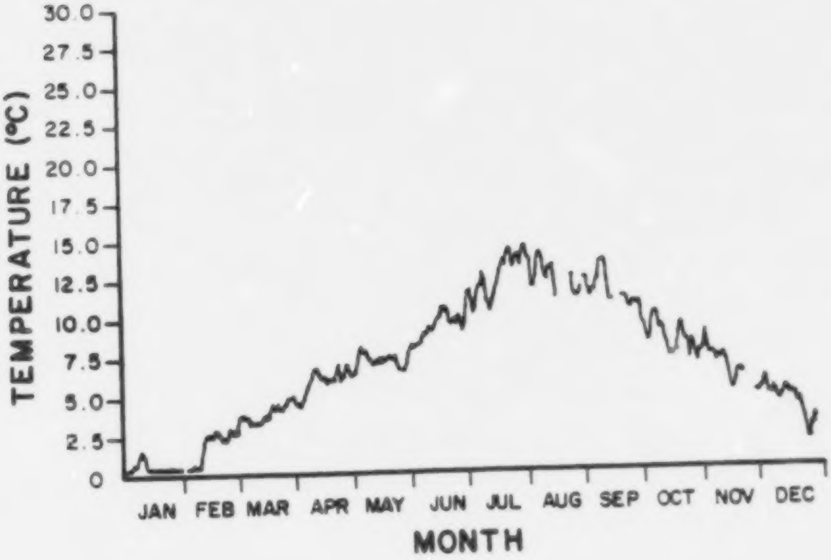
Birkenhead River 1967



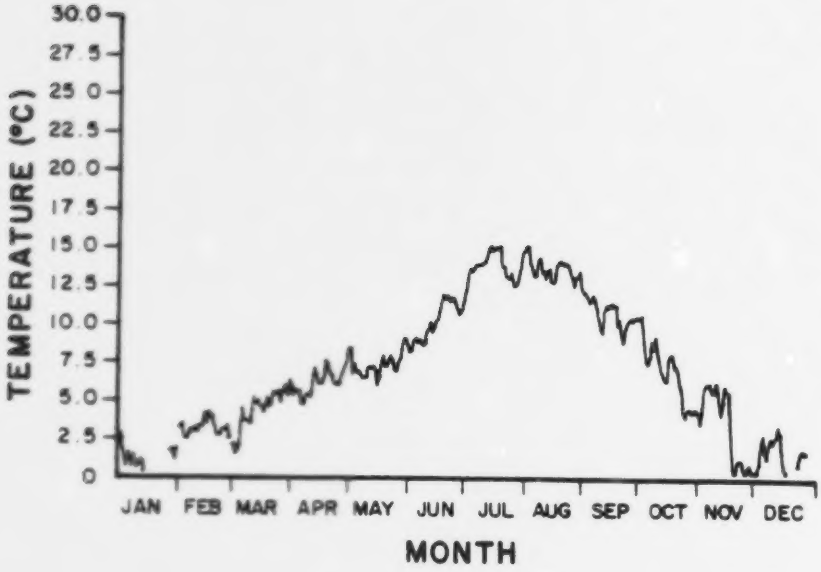
Birkenhead River 1968



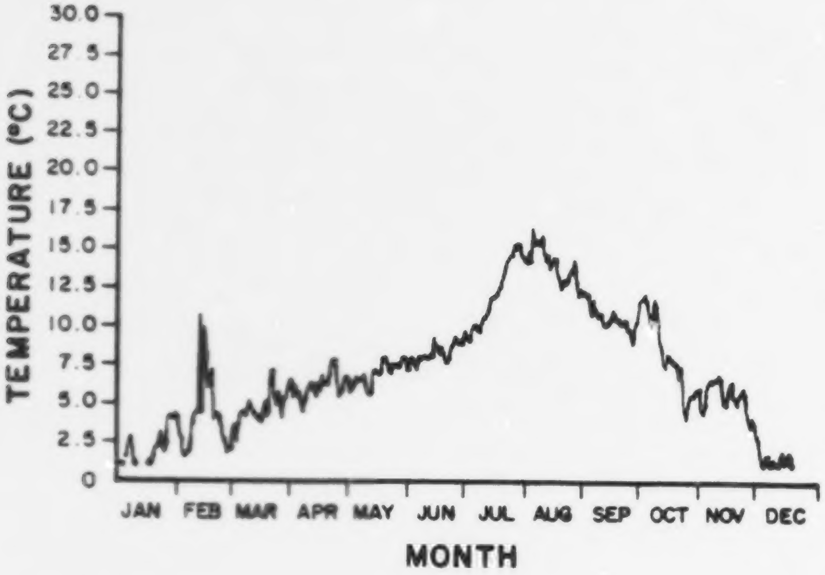
Birkenhead River 1969

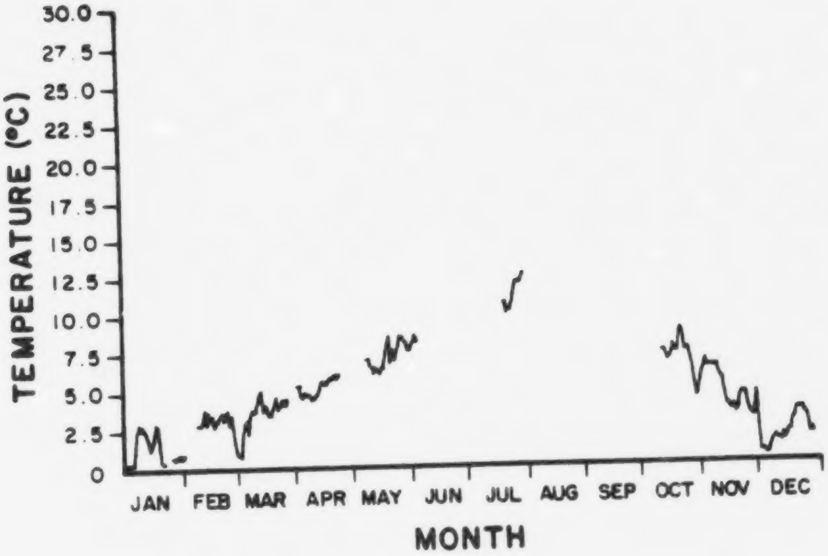


Birkenhead River 1970

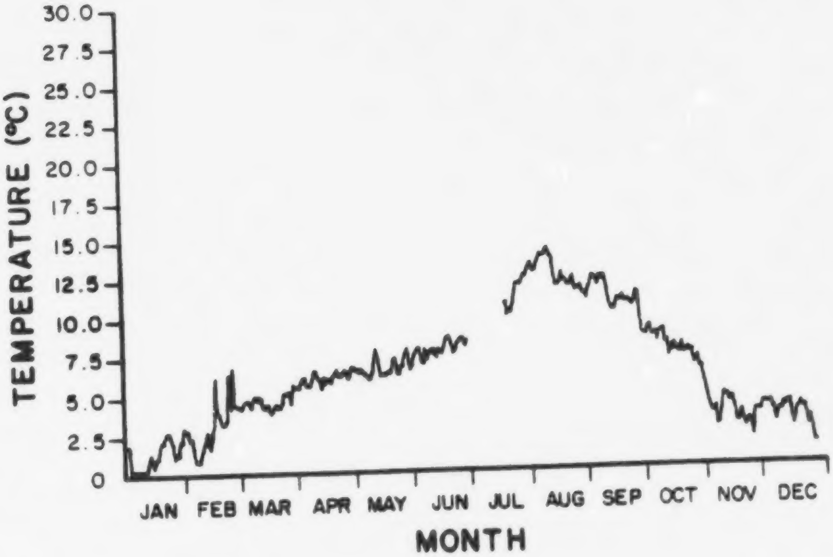


Birkenhead River 1971



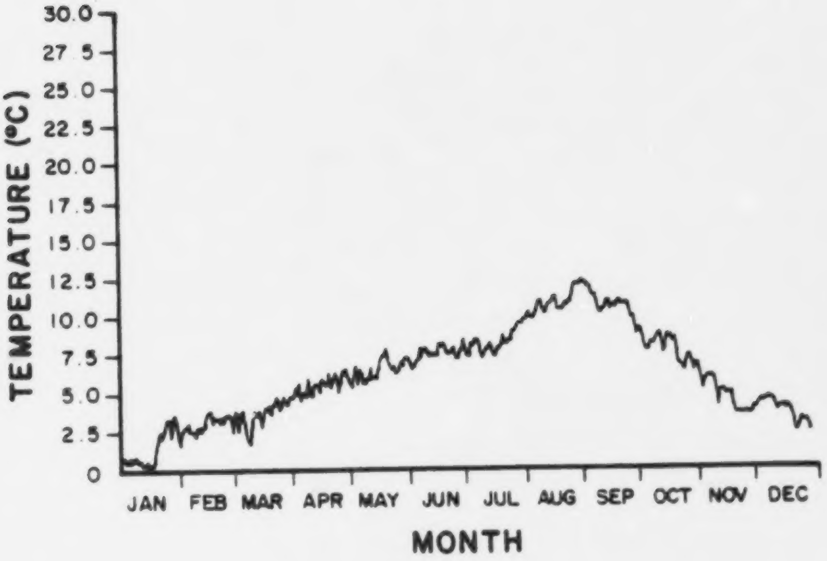


Birkenhead River 1972

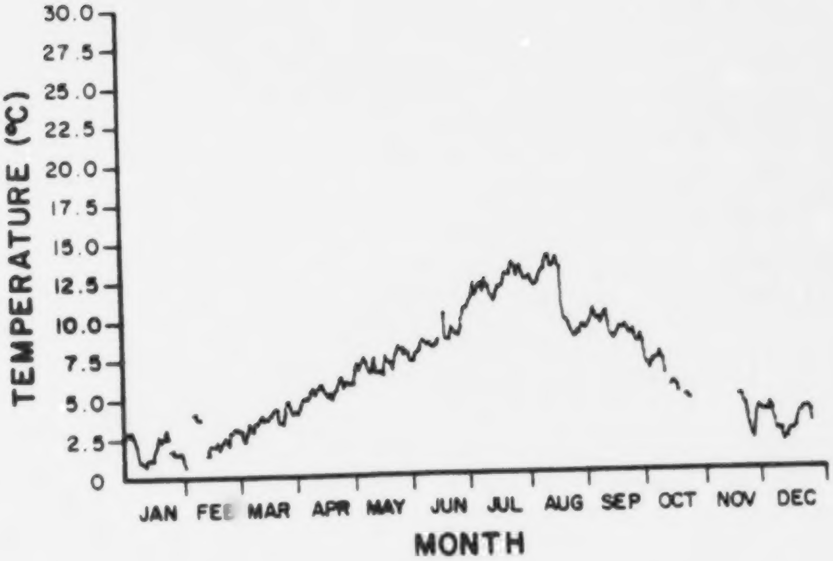


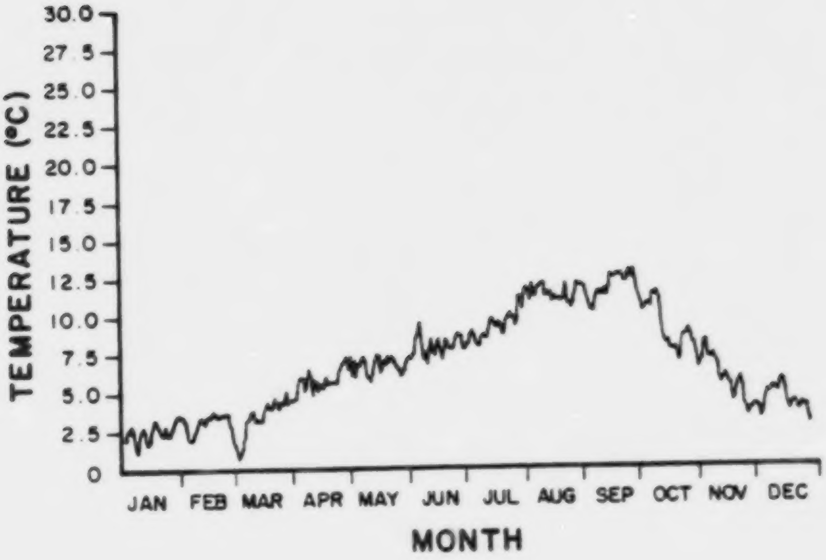
Birkenhead River 1973

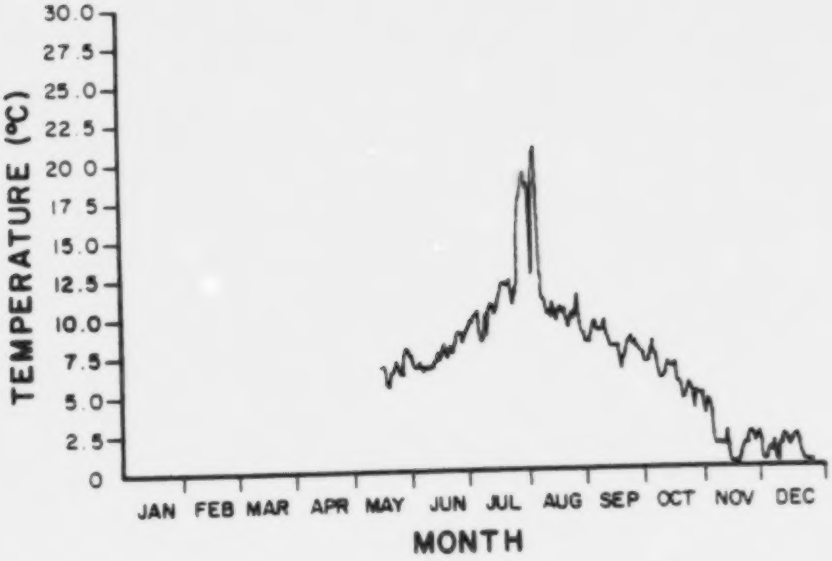
Birkenhead River 1974



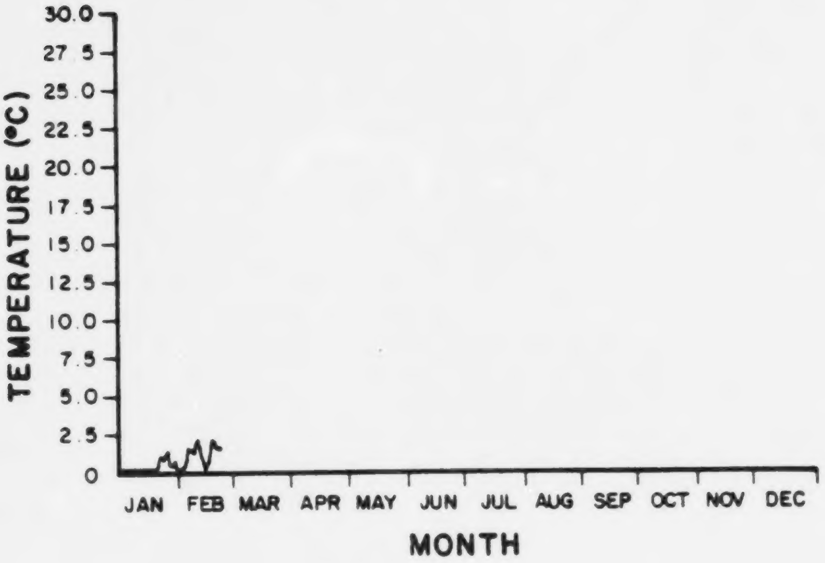
Birkenhead River 1975




Birkenhead River 1976


Birkenhead River 1978

Birkenhead River 1979



Facility: CAPILANO

Location:

Located in Capilano Canyon Park, North Vancouver, immediately below the Cleveland Dam, on the east side of Capilano River, 5 km upstream of the river mouth.

Description:

The first modern salmon hatchery built on the Canadian west coast and completed in 1971, the facility was built to compensate for lowered stocks of coho and steelhead salmon, caused as a result of building the Cleveland Dam. Chinook have been introduced to the system.

Egg production targets for 1985 were 1.4 M coho, 3.5 M chinook, and 20 K steelhead (10 K each of summer and winter stocks). Eggs are obtained primarily from the Capilano River. Chinook smolts were obtained from the Big Qualicum hatchery in 1969; eggs from the Big Qualicum hatchery were first obtained in 1971, with more recent transfers. Juveniles are released into the Capilano River.

Water Sources:

Surface. Water is taken from the Capilano Lake at the Cleveland Dam and piped to the hatchery.

Groundwater. A natural seepage provides a good groundwater supply.

General Water Quality:

Good quality, although a settling system would be desirable for re-used water. Also the water supplies are colder than desirable for chinook and steelhead rearing. Groundwater must be heated with natural gas and mixed with river water to boost temperatures.

Special Notes:

The groundwater supply remains at a constant 7°C, thus no tables or graphs of water temperature for this source are included. Surface temperatures are taken within the hatchery, in rearing troughs containing unwarmed, unaerated, unmixed water, thus representing surface temperatures.

WATER QUALITY VALUES FOR CAPILANO
[below detection limits = 0]

PARAMETERS	MAR20/79 CAPILANO RIVER	MAY03/79 CAPILANO RIVER	MAY31/79 CAPILANO RIVER	JUN28/79 CAPILANO RIVER	JUL19/79 CAPILANO RIVER	AUG09/79 CAPILANO RIVER	AUG10/79 CAPILANO RIVER	AUG30/79 CAPILANO RIVER	SEP20/79 CAPILANO RIVER	OCT11/79 CAPILANO RIVER	OCT23/82 CAPILANO RIVER
Alkalinity	3.33	4.85	4.12	6.24	4.34	3.94	4.43	4.31	4.12	4.89	5
Ammonia	.0083	0	0	0	0	.005	0	.0075	.0118	.0078	.013
CO2											
Chloride	.81	.55	0	.5	0	0	0	.5	.55	0	.8
Color											
Conductivity Field											
Conductivity Lab	15.7	14.5	13.4	11.8	12.8	13.2	13.6	15	15.3	16.8	15.1
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	5.07	4.58	4.05	4.44	4.15	4.23	4.27	4.9	5.7	6.38	5.71
Nitrite	0	0	0	0	0	0	0	0	0	0	0
Nitrate	.215	.17	.102	.075	.13	.0825	.0855	.0855	.125	.142	.13
pH-Field											
pH-Lab	6.4	6.7	6.6	6.5	6.6	6.4	6.6	6.6	6.4	6.4	6.8
Phosphate	0	0	0	0	0	.0091	0	0	0	.0065	.008
Residue-Filterable	16	19	16	17	18	16	16	19	19	19	16
Residue-Nonfilterable	0	0	5	0	0	0	0	0	0	0	0
Silica	1.55	1.84	1.3	1.25	1.08	1.34	1.3	1.56	1.62	1.8	2.3
Sulphate	1.8	2.1	1.2	1.5	1.9	1.5	1.5	1.5	2	2.1	2.9
Taste											
Temperature											
Turbidity		0	0	0	0	0	0	0	1.3	0	1
METALS											
Al-Aluminum	.18	.12	0	0	0	0	0	0	0	0	.12
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.0039	.0031	0	0	0	0	0	0	.0032	.0034	.003
Ca-Calcium	1.64	1.5	1.35	1.53	1.35	1.39	1.41	1.63	1.91	2.14	1.5
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.148	.063	.039	.039	.079	.098	.107	.194	.2	.169	.182
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K--Potassium	.18	.172	.144	.139	.14	.146	.143	.187	.2	.22	.24
Mg-Magnesium	.236	.197	.165	.15	.168	.184	.183	.201	.225	.246	.2
Mn-MaNganese	.009	.0047	0	.004	.0046	.0074	.0078	.0122	.0152	.0103	.016
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	.54	.42	.41	.42	.41	.44	.47	.65	.56	.63	.6
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	1.02	0	0	0	0	0	0
Si-Silicon	1.71	1.57	1.35	1.33	1.33	1.2	1.28	1.65	1.52	1.61	1.7
Sn-Tin	0		0	0	0	0	0	0	0	0	0
Sr-Strontium	.0085	.0071	.0059	.006	.0063	.0065	.0065	.0076	.0073	.0079	.007
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V--Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR CAPILANO

(below detection limits = 0)

PARAMETERS	OCT23/82 GROUND WATER
Alkalinity	25
Ammonia	.005
CO2	
Chloride	1.5
Color	
Conductivity Field	
Conductivity Lab	62.9
Dissolved O2-ppm	
Dissolved O2-%sat	
Dissolved Gas Tot	
Dissolved Nitrogen	
Hardness	20.9
Nitrite	0
Nitrate	.1
pH-Field	
pH-Lab	7.1
Phosphate	.02
Residue-Filterable	58
Residue-Nonfilterable	0
Silica	6
Sulphate	3.8
Taste	
Temperature	
Turbidity	0
METALS	
Al-Aluminum	0
As-Arsenic	0
Ba-Barium	0
Ca-Calcium	5.2
Cd-Cadmium	0
Co-Cobalt	0
Cr-Chromium	0
Cu-Copper	0
Fe-Iron	0
Hg-Mercury	0
K--Potassium	1.41
Mg-Magnesium	1.9
Mn-MaNganese	0
Mo-Molybdenum	0
Na-Sodium	2.8
Ni-Nickel	0
P--Phosphorus	0
Pb-Lead	0
Sb-Antimony	0
Se-Selenium	0
Si-Silicon	9.6
Sn-Tin	0
Sr-Strontium	.021
Ti-Titanium	0
V--Vanadium	0
Zn-Zinc	0

CAPILANO RIVER 1975

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	2.52	31
FEBRUARY	-	-	1.86	28
MARCH	-	-	2.67	31
APRIL	-	-	4.27	30
MAY	-	-	5.01	31
JUNE	-	-	6.77	30
JULY	-	-	7.88	31
AUGUST	-	-	9.54	31
SEPTEMBER	-	-	10.04	30
OCTOBER	-	-	8.9	31
NOVEMBER	-	-	4.72	30
DECEMBER	-	-	2.18	31

CAPILANO RIVER 1976

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	2.19	31
FEBRUARY	-	-	2.45	28
MARCH	-	-	3.28	31
APRIL	-	-	4.31	30
MAY	-	-	6.06	31
JUNE	-	-	6.28	30
JULY	-	-	6.9	31
AUGUST	-	-	7.68	31
SEPTEMBER	-	-	9.42	30
OCTOBER	-	-	10.87	31
NOVEMBER	-	-	7.98	30
DECEMBER	-	-	5.82	31

CAPILANO RIVER 1977

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	3.99	31
FEBRUARY	-	-	3.78	28
MARCH	-	-	4.73	31
APRIL	-	-	6.72	30
MAY	-	-	7.42	31
JUNE	-	-	8.12	30
JULY	-	-	8.65	31
AUGUST	-	-	11.39	31
SEPTEMBER	-	-	13.14	30
OCTOBER	-	-	10.97	31
NOVEMBER	-	-	6.86	30
DECEMBER	-	-	4.1	31

CAPILANO RIVER 1978

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	2.99	31
FEBRUARY	-	-	3.89	28
MARCH	-	-	4.59	31
APRIL	-	-	6.46	30
MAY	-	-	7.17	31
JUNE	-	-	7.49	30
JULY	-	-	8.86	31
AUGUST	-	-	11.69	31
SEPTEMBER	-	-	11.54	30
OCTOBER	-	-	11.28	31
NOVEMBER	-	-	6.7	30
DECEMBER	-	-	3.65	31

CAPILANO RIVER 1979

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	1.05	31
FEBRUARY	-	-	1.21	27
MARCH	-	-	3.02	31
APRIL	-	-	5.21	30
MAY	-	-	5.91	31
JUNE	-	-	6.48	30
JULY	-	-	8.11	31
AUGUST	-	-	11.05	31
SEPTEMBER	-	-	12.06	30
OCTOBER	-	-	12.23	31
NOVEMBER	-	-	7.98	30
DECEMBER	-	-	5.24	31

CAPILANO RIVER 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	2.83	31
FEBRUARY	-	-	2.31	28
MARCH	-	-	3.96	31
APRIL	-	-	4.88	30
MAY	-	-	5.97	31
JUNE	-	-	6.43	30
JULY	-	-	7.41	31
AUGUST	-	-	9.14	31
SEPTEMBER	-	-	10.77	30
OCTOBER	-	-	11.5	31
NOVEMBER	-	-	7.28	30
DECEMBER	-	-	4.73	31

CAPILANO RIVER 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	5.42	31
FEBRUARY	-	-	5.27	28
MARCH	-	-	5.88	31
APRIL	-	-	6.15	30
MAY	-	-	6.67	31
JUNE	-	-	7.47	30
JULY	-	-	8.71	31
AUGUST	-	-	10.69	31
SEPTEMBER	-	-	12.37	30
OCTOBER	-	-	9.42	31
NOVEMBER	-	-	7.74	30
DECEMBER	-	-	5.34	31

CAPILANO RIVER 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	3.02	31
FEBRUARY	-	-	2.89	28
MARCH	-	-	2.84	31
APRIL	-	-	3.7	30
MAY	-	-	5.45	31
JUNE	-	-	6.05	30
JULY	-	-	7.06	31
AUGUST	-	-	9.15	31
SEPTEMBER	-	-	11.77	30
OCTOBER	-	-	10.82	31
NOVEMBER	-	-	6.48	30
DECEMBER	-	-	4	31

CAPILANO RIVER 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	3.47	31
FEBRUARY	-	-	3.59	27
MARCH	-	-	4.58	31
APRIL	-	-	5.92	30
MAY	-	-	7.16	31
JUNE	-	-	7.97	30
JULY	-	-	8.74	31
AUGUST	-	-	10.39	31
SEPTEMBER	-	-	13.32	30
OCTOBER	-	-	12.81	31
NOVEMBER	-	-	7.88	30
DECEMBER	-	-	4.4	31

CAPILANO RIVER 1984

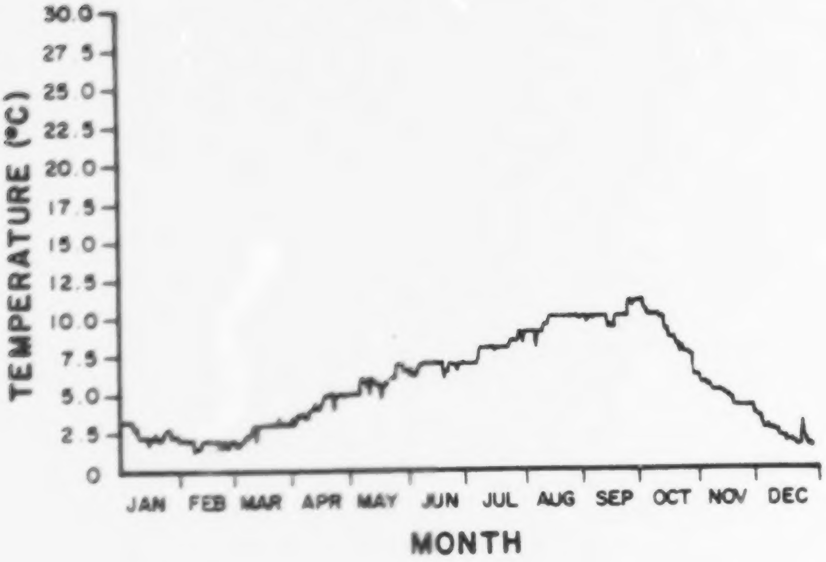
MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	2.95	31
FEBRUARY	-	-	3.05	28
MARCH	-	-	3.92	31
APRIL	-	-	5	30
MAY	-	-	5.53	31
JUNE	-	-	6.23	30
JULY	-	-	7.79	31
AUGUST	-	-	10.1	31
SEPTEMBER	-	-	12.82	30
OCTOBER	-	-	10.94	31
NOVEMBER	-	-	6.15	30
DECEMBER	-	-	3.45	31

CAPILANO RIVER 1985

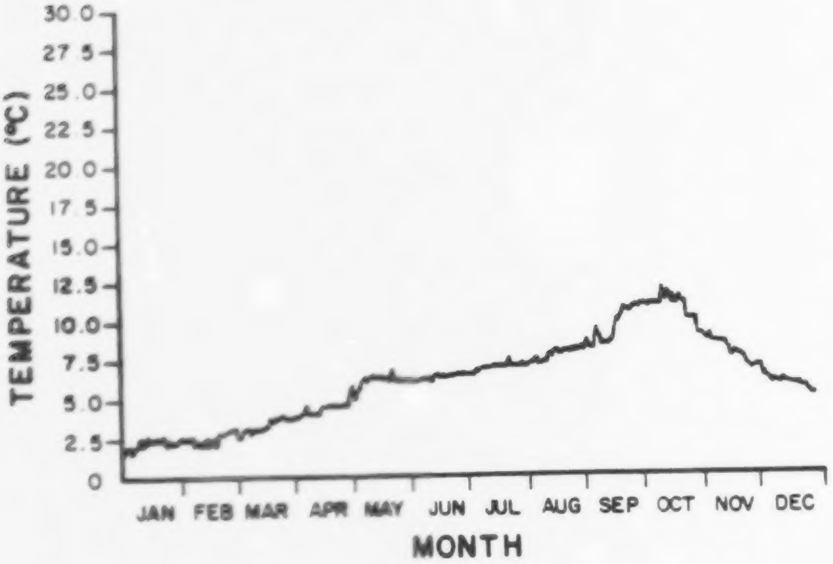
MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	2.03	31
FEBRUARY	-	-	2	28
MARCH	-	-	2.66	31
APRIL	-	-	4.12	30
MAY	-	-	5.95	31
JUNE	-	-	6.7	30
JULY	-	-	9.08	31
AUGUST	-	-	12.34	31
SEPTEMBER	-	-	13.38	30
OCTOBER	-	-	10.18	31
NOVEMBER	-	-	5.43	30
DECEMBER	-	-	1.94	31

CAPILANO RIVER 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	2.47	31
FEBRUARY	-	-	3.02	28
MARCH	-	-	3.95	31
APRIL	-	-	5.72	30
MAY	-	-	5.92	31
JUNE	-	-	6	2
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		



Capilano River 1975



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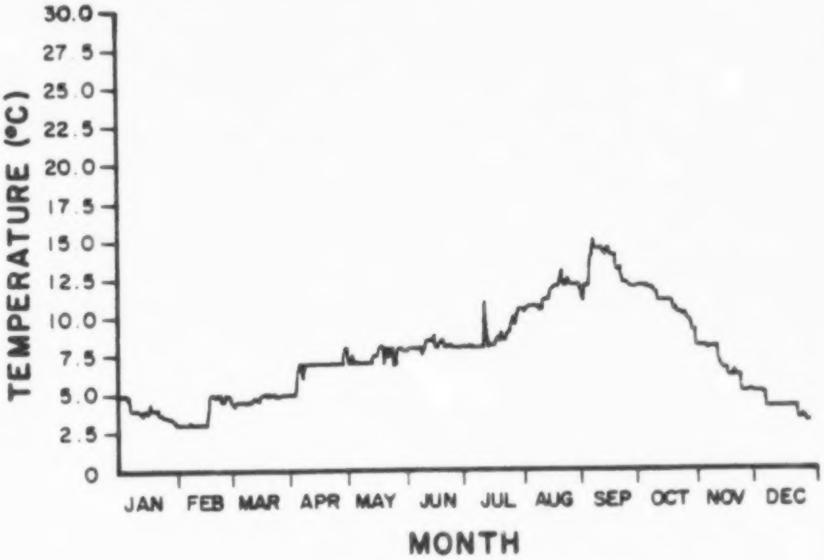
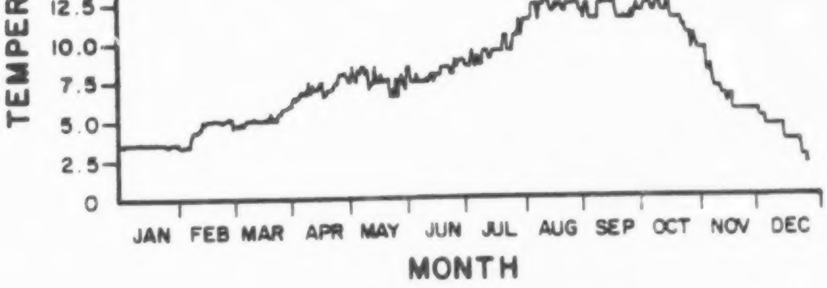


Capilano River 1977



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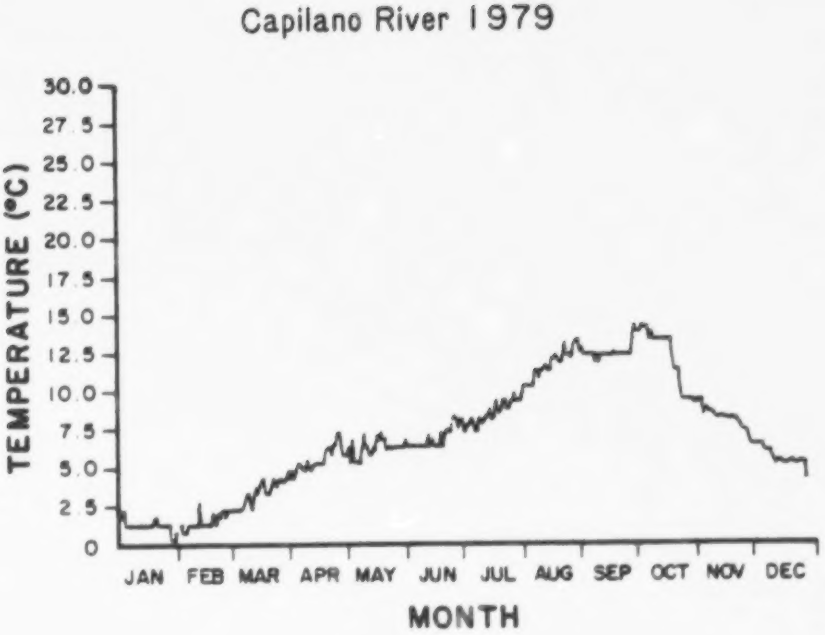
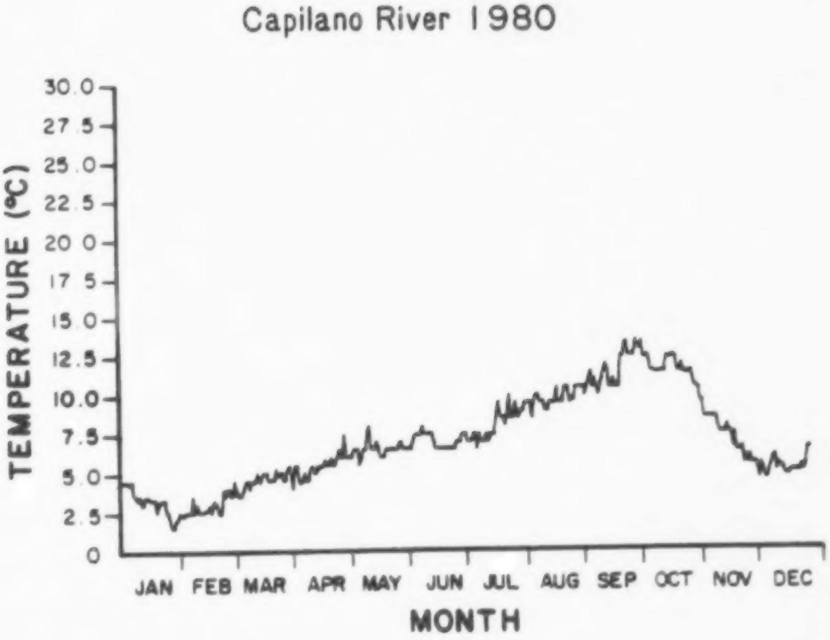
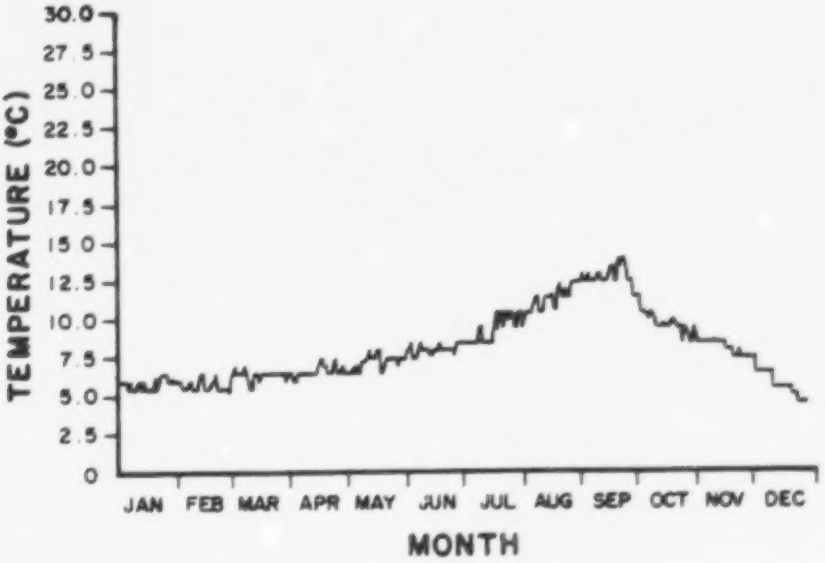

Capilano River 1979
TEMPERATURE (°C)
30.0
27.5
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH


Capilano River 1980
TEMPERATURE (°C)
30.0
27.5
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH

Capilano River 1981



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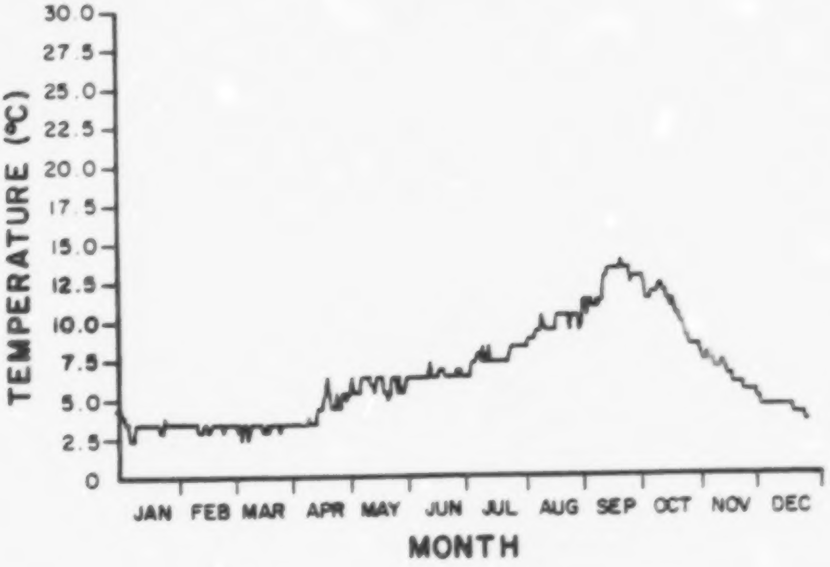

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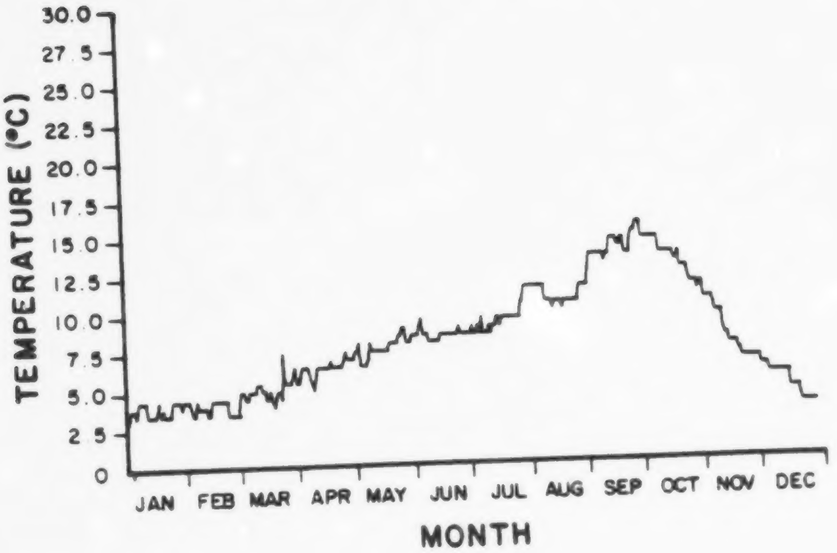

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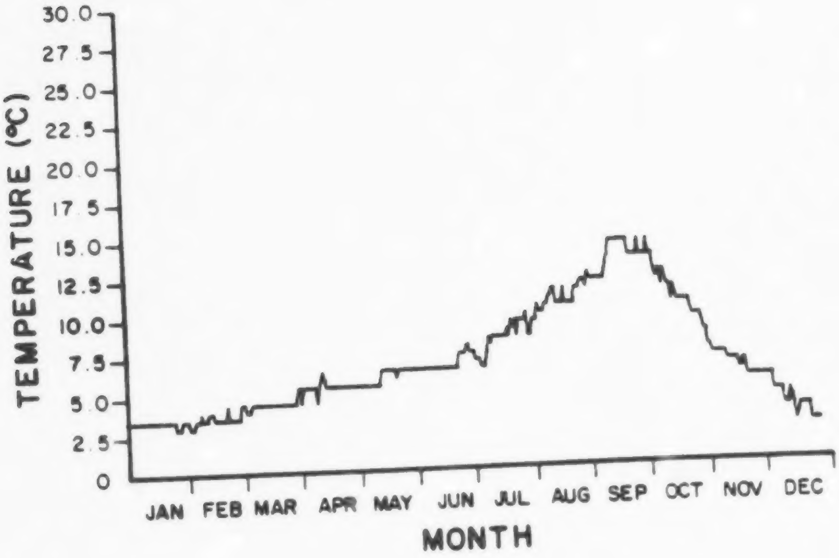

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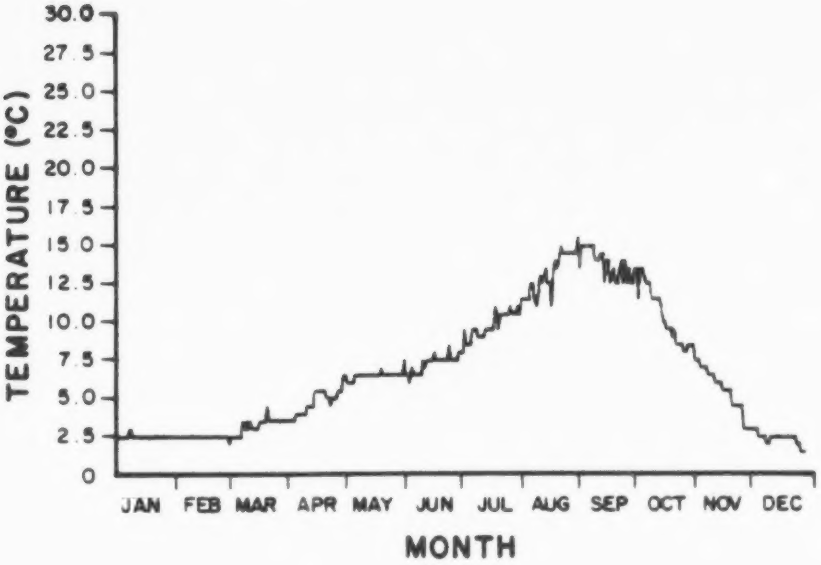

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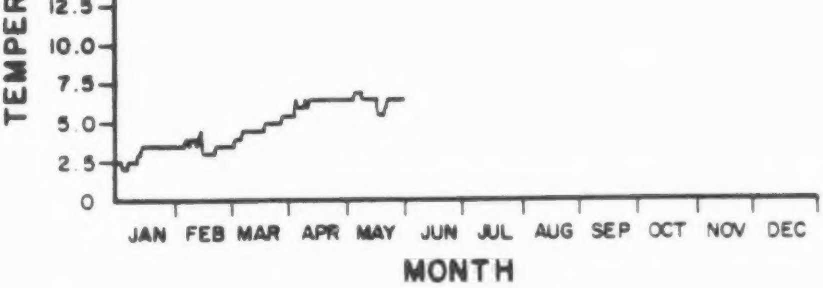


Facility: CHEHALIS

Location:

Located on Morris Valley Road near the Chehalis River bridge, 95 km east of Vancouver near Harrison Mills.

Description:

Built in 1981 and first operated in 1982, the hatchery utilizes a combination of conventional and Japanese-style methods to increase chum, chinook, coho, steelhead and cutthroat trout in the general area.

Egg production targets in 1985 were 750 K coho, 14 M chum, 210 K steelhead and 50 K cutthroat trout. The hatchery obtains eggs from various stocks of the watershed and the Hicks/Maria slough area.

Water Sources:

Surface. The hatchery is fed by gravity from an intake on the Chehails River, 1 km upstream of the facility.

Groundwater. There are three wells in use: PW-C1 (well #1), TW-C1 (well #2) and PW-C3 (well #3). The latter numbers have been used here.

General Water Quality:

Sodium ion levels are low, the water is very soft and is of low pH, conductivity, alkalinity, hardness, filterable residue and calcuim. Aeration increases the pH slightly, to an acceptable level. The river water supply has excessive amounts of sand, which settles out at various points in the hatchery, and is also soft and acidic. The year round temperature of the river water is fairly stable. An electric heater is used to raise incubation temperatures up to 8°C above ambient, for trout only.

Special Notes:

Mixed well water temperatures have been recorded from within the hatchery, but separate profiles have not been kept. Well #3, which was monitored during operation as a pilot hatchery, remained at a constant 8°C. As the wells have been plumbed into a single pipeline to the aeration tower, separate well temperatures have only been available when there has only been a single well pumping at a time. Such times have been sporadic, as can be seen in the water temperature plots for wells 1 and 2. Water quality samples taken from the wells have been taken before aeration for those samples that are numbered by well, and after aeration if the samples are from "mixed wells".

Additional data on water quality samples taken in 1980 for the Chehalis River and wells 1, 2 and 3, and for water temperature records for the Chehalis River in 1980, are available in MacKinlay (1984).

WATER QUALITY VALUES FOR CHEHALIS
(below detection limits = 0)

PARAMETERS	FEB18/80 CHEHALIS RIVER	FEB21/80 CHEHALIS RIVER	APR06/80 CHEHALIS RIVER	MAY13/80 CHEHALIS RIVER	JUN19/80 CHEHALIS RIVER	JUL23/80 CHEHALIS RIVER	NOV10/80 CHEHALIS RIVER	APR30/81 CHEHALIS RIVER	DEC29/83 CHEHALIS RIVER	FEB08/84 CHEHALIS RIVER	FEB18/80 WELL # 1
Alkalinity	4.12	5.1	6.12	5.58	6.35	7	6.63	5.86	7.5		6.7
Ammonia	.008	0	0	0	0	0	0	0	0		0
CO2											
Chloride	1	.5	.5	0	.73	0	0	.61	.6		.5
Color											
Conductivity Field											
Conductivity Lab	16.8	23.4	24.4	22	23.1	26.2	20.5	20	36.1		29.5
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	7.3	9.5	9.74	8.15	8.17	10.1	8.29	7.05	13.8	10.3	11.4
Nitrite	0	0	0	0	0	0	0	0	0		0
Nitrate	.096	.258	.0799	.0747	.0524	0	.096	.084	.11		.092
pH-Field	6.6	5.6	6.8	6.7		6.7	0		7		6.2
pH-Lab					6		6.9	6.9			
Phosphate	.042	.006	0	0	.0053	0	.0052	0	.003		0
Residue-Filterable					19	25	20	20			
Residue-Nonfilterable					0	0	9	0			
Silica					.69	2.09	1.88	1.81			
Sulphate	2.7	3.6	4.05	3.5	3.8	4.8	4	3.2	7.2		5
Taste											
Temperature											
Turbidity	30	0	1.3	0	0	0	2.8	1.5	0		0
METALS											
Al-Aluminum	.63	.18	.174	0	0	0	.156	.119	0	.13	0
As-Arsenic					0	0	0	0	0	0	
Ba-Barium					.006	.0082	.009	.0057	.008	.008	
Ca-Calcium	2.4	3.2	.02	2.82	2.81	3.52	2.81	2.38	4.6	3.3	0
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt					0	0	0	0	0	0	
Cr-Chromium					0	0	0	0	0	0	
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.33	.09	.082	.028	.018	.016	.078	.057	.014	.046	0
Hg-Mercury	0	0	0	0	.004	0	0	0	0		
K--Potassium	.16	.15	.127	.119	.114	.129	.13	.13	.131	.15	4
Mg-Magnesium	.34	.38	.369	.269	.279	.313	.31	.27	.5	.3	0
Mn-Manganese	.018	.006	.0039	0	0	0	.0043	.0034	.001	.003	0
Mo-Molybdenum					0	0	0	0	0	0	
Na-Sodium	.58	.82	.731	.582	.626	.827	.671	.72	1.1	.8	.12
Ni-Nickel					0	0	0	0	0	0	
P--Phosphorus					0	0	0	0	0	0	
Pb-Lead	0	0	0	0	0	0	0	0	0	0	.003
Sb-Antimony					0	0	0	0	0	0	
Se-Selenium					0	0	0	0	0	0	
Si-Silicon					1.83	2.07	1.93	1.64	2.9	2.4	
Sn-Tin					0	0	0	0	0	0	
Sr-Strontium					.0078	.0105	.0077	.0074	.015	.01	
Ti-Titanium					0	0	0	.0107	0	0	
V--Vanadium					0	0	0	0	0	0	
Zn-Zinc	0	0	.0016	.0042	0	0	.0016	0	0	0	0

WATER QUALITY VALUES FOR CHEHALIS
[below detection limits = 0]

	FEB20/80	FEB21/80	JAN19/83	FEB08/84	APR12/84	DEC20/84	NOV08/85	JAN19/83	FEB08/84	APR11/84	DEC17/84
	WELL	WELL	WELL	WELL	WELL	WELL	WELL	WELL	WELL	WELL	WELL
PARAMETERS	# 1	# 1	# 1	# 1	# 1	# 1	# 1	# 2	# 2	# 2	# 2
Alkalinity	6.9	6.6	7			6.3		6			6.1
Ammonia	0	0	0			0		0			0
CO2											
Chloride	0	.5	.6			1		0			1.2
Color											
Conductivity Field											
Conductivity Lab	28.8	28.8	26.1			27.5		24.6			28
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	11.1	11.2	9.34	9.2	9.56	10.9	11.1	8.48	10.3	8.25	9.87
Nitrite	0	0	0			0		0			0
Nitrate	.137	.197	.11			.09		.1			.08
pH-Field	6.2	6.21	6.4			6.5					6.2
pH-Lab								6.5			
Phosphate	0	0	.006			.004		0			.002
Residue-Filterable								29			
Residue-Nonfilterable								0			
Silica								2.4			
Sulphate	4.8	5	4.3			4		5.1			4
Taste											
Temperature											
Turbidity	0	0	0			2.8		0			1
METALS											
Al-Aluminum	0	0	.005	0	.146	0	.004	0	.13	0	0
As-Arsenic				0			0	0	0		
Ba-Barium				.006			.008	.005	.008		
Ca-Calcium	0	0	0	3.2	0	.08	3.7	2.9	3.3	2.9	3.3
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt				0			0	0	0		
Cr-Chromium				0			0	0	0		
Cu-Copper	0	0	0	0	.039	0	0	0	0	0	0
Fe-Iron	0	0	0	0	0	.08	0	0	.055	.007	.05
Hg-Mercury								0		0	0
K--Potassium	3.9	3.9	3.1	.16	3.2	3.5	.17	.11	.14	.09	.13
Mg-Magnesium	0	0	.018	.3	.066	.035	.4	.3	.3	.3	.4
Mn-Manganese	0	0	0	0	0	0	0	0	.003	0	.001
Mo-Molybdenum				0			0	0	0		
Na-Sodium	.13	.12	.14	.8	.11	.13	1	.8	.9	.7	.9
Ni-Nickel				0			0	0	0		
P--Phosphorus				0			0	0	0		
Pb-Lead	.003	.003	.001	0	.003	.002	0	0	0	0	0
Sb-Antimony				0				0	0		
Se-Selenium				0			0	0	0		
Si-Silicon				2.3			1.9	2.1	2.4		
Sn-Tin				0			0	0	0		
Sr-Strontium				.01			.013	.01	.011		
Ti-Titanium				0			.003	0	0		
V--Vanadium				0			0	0	0		
Zn-Zinc	0	0	0	0	.004	0	0	0	0	.037	.079

WATER QUALITY VALUES FOR CHEHALIS
(below detection limits = 0)

PARAMETERS	NOV07/85 WELL # 2	OCT15/80 WELL # 3	OCT15/80 WELL # 3	JAN19/83 WELL # 3	FEB08/84 WELL # 3	APR12/84 WELL # 3	DEC20/84 WELL # 3	NOV07/85 WELL # 3	JUL23/80 WELL # 3	DEC29/83 MIXED WELLS	DEC29/83 MIXED WELLS
Alkalinity		10.8	8.51	10			8.9		9	7	7
Ammonia		0	0	0			0		0	0	0
CO2											
Chloride		1.25	1.8	.6			1.6		0	.5	.5
Color											
Conductivity Field											
Conductivity Lab		35.8	26.5	31.2			34		30.2	27.5	27.4
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	10.9	14.7	10	11.5	11.2	10.6	12.3	10.8	11.7	11	9.54
Nitrite		0	0	0			0		0	0	0
Nitrate		.122	.0738	.09			.12		0	.11	.11
pH-Field							5.9		6.6	6.6	6.6
pH-Lab		7.1	7.1	6.4					6		
Phosphate		0	0	0			.003		0	.188	0
Residue-Filterable		27	30						25		
Residue-Nonfilterable		0	0						0		
Silica		0	NA	3.3					3.5		
Sulphate		6.05	3.3	3.9			3		4.3	4.8	4.3
Taste											
Temperature											
Turbidity		0	0	0			1.5		0	11.8	0
METALS											
Al-Aluminum	.005	0	.105	0	.23	0	0	.005	0	.11	0
As-Arsenic	0	0	0		0			0	0		
Ba-Barium	.008	.0048	.0129	.008	.009			.008	.0091		
Ca-Calcium	3.7	5.15	3.31	3.9	3.3	3.6	4.1	3.7	4.08	3.5	3.3
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0			0	0		
Cr-Chromium	0	0	0	0	0			0	0		
Cu-Copper	0	0	0	0	0	.003	.005	0	0	0	0
Fe-Iron	0	0	.052	.011	.074	.055	.113	0	.012	.136	0
Hg-Mercury		0	0	0		0	0		0	0	0
K--Potassium	.16	.173	.428	.15	.16	.15	.15	.16	.138	.126	.115
Mg-Magnesium	.4	.448	.422	.4	.3	.3	.4	.4	.365	.4	.3
Mn-Manganese	0	0	0	0	.006	0	0	0	0	.004	0
Mo-Molybdenum	0	0	0	0	0			.006	0		
Na-Sodium	1	.774	.783	1	.8	.9	1	1	1.17	.9	.9
Ni-Nickel	0	0	0	0	0			0	0		
P--Phosphorus	0	0	0	0	0			0	0		
Pb-Lead	0	0	0	0	0	0	.003	0	0	0	0
Sb-Antimony		0	0	0	0				0		
Se-Selenium	0	0	0	0	0			0	0		
Si-Silicon	1.9	2.41	2	3	2.5			1.9	3.54		
Sn-Tin	.01	0	0	0	0			.01	0		
Sr-Strontium	.013	.0129	.0168	.014	.011			.012	.0119		
Ti-Titanium	.004	0	0	0	.003			.003	0		
V--Vanadium	0	0	0	0	0			0	0		
Zn-Zinc	0	0	0	.005	0	.013	.055	0	0	0	0

WATER QUALITY VALUES FOR CHEHALIS
(below detection limits = 0)

PARAMETERS	FEB08/84 MIXED WELLS	FEB05/85 MIXED WELLS	FEB25/85 MIXED WELLS	FEB25/85 MIXED WELLS	MAY16/85 MIXED WELLS	MAY16/85 MIXED WELLS	DEC12/85 MIXED WELLS	DEC12/85 MIXED WELLS	DEC12/85 MIXED WELLS	DEC12/85 MIXED WELLS	DEC12/85 MIXED WELLS
Alkalinity		6.3	7.4	6.3							
Ammonia		.047	0	.082							
CO2											
Chloride		.6	0	0							
Color											
Conductivity Field											
Conductivity Lab		30.5	32	29.5							
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	11.2	10.7	10.4	10.7			9.92	9.63	9.8	9.73	9.63
Nitrite		0	0	0							
Nitrate		.11	.12	.13							
pH-Field		6.4	6.5	6.4							
pH-Lab											
Phosphate		.022	.005	.65							
Residue-Filterable		25									
Residue-Nonfilterable		0									
Silica											
Sulphate		6	6	5							
Taste											
Temperature											
Turbidity		.3	.12	.13							
METALS											
Al-Aluminum	.23	0	0	0	0	0	0	0	0	0	0
As-Arsenic		0	0	0			0	0	0	0	0
Ba-Barium		.006	.008	.008			.007	.007	.007	.007	.007
Ca-Calcium	3.3	3.5	3.4	3.4	3.6	3.6	3.4	3.3	3.4	3.3	3.3
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt		0	0	0			0	0	0	0	0
Cr-Chromium		0	0	.981			0	0	0	0	0
Cu-Copper	.001	0	0	0	0	0	0	0	.057	0	0
Fe-Iron	.074	0	.008	.01	.007	0	.007	0	0	0	0
Hg-Mercury		0	0								
K--Potassium	.16	.1	.08	.85	.12	.12	.14	.12	.12	.13	.12
Mg-Magnesium	.3	.4	.4	.4	.4	.4	.3	.3	.3	.3	.3
Mn-Manganese	.006	0	0	.001	0	0	0	0	0	0	0
Mo-Molybdenum		0	0	0			0	0	0	0	0
Na-Sodium	.8	.8	.8	.8	.9	.9	.9	.9	.9	.1	.9
Ni-Nickel		0	0	0			0	0	0	0	0
P--Phosphorus		0	0	0			0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony		0	0	0			0	0	0	0	0
Se-Selenium		0	0	0			0	0	0	0	0
Si-Silicon		.5	2.4	2.4			2.2	2.2	2.2	2.1	1.9
Sn-Tin		0	0	0			0	0	0	0	0
Sr-Strontium		.011	.011	.011			.012	.012	.012	.012	.012
Ti-Titanium		0	0	0			0	0	0	0	0
V--Vanadium		0	0	0			0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR CHEHALIS
[below detection limits = 0]

PARAMETERS	DEC12/85 MIXED WELLS	DEC18/85 MIXED WELLS	DEC19/85 MIXED WELLS	JAN03/86 MIXED WELLS	JAN03/86 MIXED WELLS	JAN03/86 MIXED WELLS	JAN03/86 MIXED WELLS	JAN17/86 MIXED WELLS	JAN17/86 MIXED WELLS	FEB03/86 MIXED WELLS	FEB03/86 MIXED WELLS
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	9.81	9.99	10	10.7	9.53			0	0	10.1	10.1
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue-Filterable											
Residue-Nonfilterable											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS											
Al-Aluminum	0	.003	.13	0	0	0	0	.003	.004	.013	.009
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.007	.007	.007	.006	.006	.006	.006	.006	.006	.006	.006
Ca-Calcium	3.4	3.4	3.4	3.4	3.3	3.4	3.4	3.5	3.5	3.4	3.5
Cd-Cadmium	0	0	0	.005	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	0	0	.005	0	.008	0	0	0	0	.005	0
Hg-Mercury				0	0	0	0	0	0		
K—Potassium	.13	.14	0	0	.15	0	0	.08	.08	.07	.08
Mg-Magnesium	.3	.4	.4	.4	.3	.4	.3	.4	.4	.4	.4
Mn-Manganese	0	0	0	0	0	0	0	0	0	0	0
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	.1	.9	1	1	.9	.9	.9	.9	.8	.8	.8
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	2.1	2	2	1.8	1.8	1.8	1.8	2.4	2.4	2.4	2.5
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.012	.012	.013	.012	.012	.012	.012	.012	.012	.011	.011
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR CHEHALIS
[below detection limits = 0]

PARAMETERS	FEB10/86 MIXED WELLS	FEB10/88 MIXED WELLS	FEB14/86 MIXED WELLS	FEB14/86 MIXED WELLS	FEB24/86 MIXED WELLS	FEB24/86 MIXED WELLS	MAR25/86 MIXED WELLS	MAR25/88 MIXED WELLS
Alkalinity	6.9							
Ammonia								
CO2								
Chloride								
Color								
Conductivity Field								
Conductivity	28							
Dissolved O2-ppm								
Dissolved O2-%sat								
Dissolved Gas Tot								
Dissolved Nitrogen								
Hardness	10.1	10.2	10.1	9.92	9.81	9.84	9.48	10.1
Nitrite								
Nitrate								
pH-Field								
pH-Lab	6.5							
Phosphate								
Residue-Filterable								
Residue-Nonfilterable								
Silica								
Sulphate								
Taste								
Temperature								
Turbidity								
METALS								
Al-Aluminum	.008	.006	.007	.008	.01	.008	.005	.007
As-Arsenic	0	0	0	0	0	0	0	
Ba-Barium	.006	.008	.006	.008	.006	.005	.008	.008
Ca-Calcium	34	3.4	3.5	3.4	3.2	3.3	3.4	3.5
Cd-Cadmium	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0
Fe-Iron	0	0	.008	0	.1	.013	0	
Hg-Mercury			0	0			0	0
K--Potassium	.07	.07	.07	.07	.08	.08	.08	.08
Mg-Magnesium	.4	.4	.4	.4	.3	.4	.3	.4
Mn-Manganese	0	0	0	0	0	0	.001	.001
Mo-Molybdenum	0	0	0	0	0	0	0	0
Na-Sodium	.8	.9	.4	.5	.9	.7	.7	.8
Ni-Nickel	0	0	0	0	0	0	0	0
P--Phosphorus	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0
Si-Silico.	1.6	1.5	2.4	2.4	1.6	1.7	2.1	2.1
Sn-Tin	0	0	.01	.03	.02	0	0	0
Sr-Strontium	.011	.011	.011	.012	.012	.01	.011	.011
Ti-Titanium	0	0	0	0	0	0	0	0
V--Vanadium	0	0	0	0	0	0	0	0
Zn-Zinc	.002	0	0	0	0	0	0	0

CHEHALIS RIVER 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY	6.1	10	7.46	19
JUNE	7.2	13.2	9.84	30
JULY	10.2	16.5	12.73	25
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

CHEHALIS RIVER 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	4.4	4
FEBRUARY		NO DATA		
MARCH	5.2	6.1	5.81	9
APRIL	4.9	11.7	7.61	26
MAY	8.4	17.1	11.04	31
JUNE	12.8	13.7	12.34	6
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	9.5	17.6	12.76	30
OCTOBER	8.7	11.2	9.85	31
NOVEMBER	5	10.1	7.65	30
DECEMBER	.8	5.8	3.39	31

CHEHALIS RIVER 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2	5.4	3.95	31
FEBRUARY	3.6	5.8	4.53	28
MARCH	3.7	7.4	5.15	29
APRIL	4.3	8.8	6.11	30
MAY	5.8	11	7.55	31
JUNE	7.5	15	10.32	30
JULY	10.1	19.7	14.29	31
AUGUST	14.1	20.1	16.99	31
SEPTEMBER	10	16.8	13.12	30
OCTOBER	4.6	13.1	9.71	31
NOVEMBER	2.5	7.2	5.7	30
DECEMBER	.3	5.1	3.38	31

CHEHALIS RIVER 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	1.3	4	2.64	31
FEBRUARY	.3	4.3	2.41	28
MARCH	2.5	5.6	3.84	31
APRIL	3.7	7.2	5.06	30
MAY	4.6	10.8	7.26	31
JUNE	7.8	14.2	10.52	30
JULY	11.7	20.9	16.82	31
AUGUST	13.7	19.5	16.81	31
SEPTEMBER	10	15.9	13.26	30
OCTOBER	6.9	12.3	9.45	31
NOVEMBER	.2	8	3.93	30
DECEMBER	.2	3.3	2.25	31

CHEHALIS RIVER 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2	4.7	3.69	31
FEBRUARY	.2	5	3.08	28
MARCH	3.7	6	4.85	31
APRIL	4.4	7.5	5.73	30
MAY	5.6	9.2	6.97	7
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

WELL #1 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL	5.3	8.4	7.4	11
MAY	7.3	7.6	7.46	13
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	-	-	10.87	11
NOVEMBER	-	-	10.3	2
DECEMBER		NO DAT		

WELL #2 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH	-	-	5.79	11
APRIL	5.2	6.7	5.78	11
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	-	-	11.65	15
NOVEMBER	-	-	11.5	1
DECEMBER		NO DATA		

MIXED WELLS 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	9	12.4	18.4	18
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	9	12.4	10.1	17
NOVEMBER	9	10.9	10.46	24
DECEMBER	9.4	10.5	10.2	4

MIXED WELLS 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	8.09	10
FEBRUARY		NO DATA		
MARCH	-	-	6.3	1
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	-	-	11.2	6
NOVEMBER	1000	337	.13	30
DECEMBER	1000	10.7	6.64	31

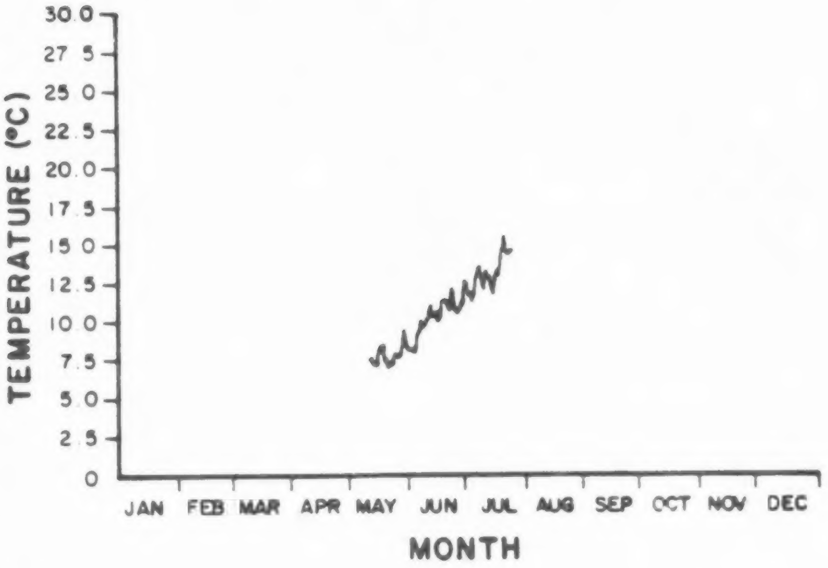
MIXED WELLS 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	7.92	31
FEBRUARY	-	-	6.06	28
MARCH	-	-	5.33	24
APRIL	-	-	5.4	30
MAY	-	-	5.74	31
JUNE	-	-	6.56	30
JULY	-	-	7.03	31
AUGUST	-	-	7.89	31
SEPTEMBER	-	-	8.7	30
OCTOBER	-	-	9.1	31
NOVEMBER	-	-	10.01	30
DECEMBER	-	-	9.77	31

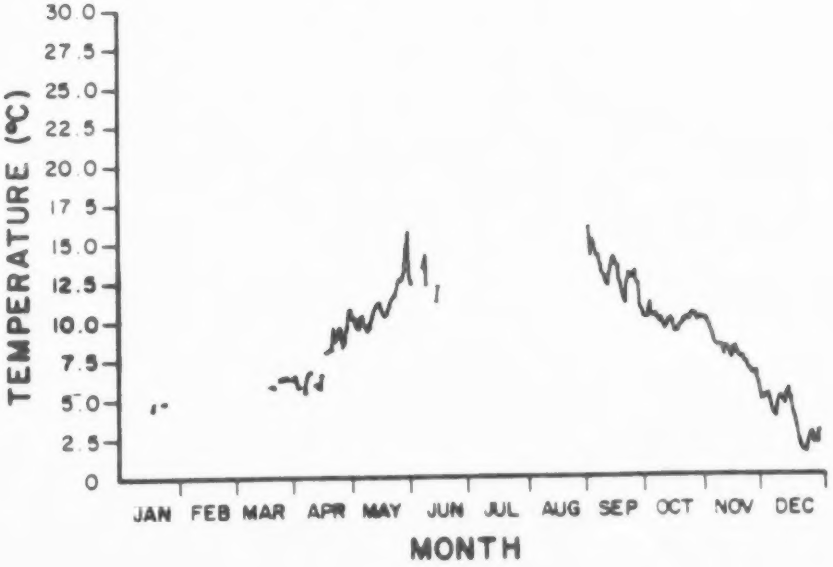
MIXED WELLS 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	7.92	31
FEBRUARY	-	-	6.04	28
MARCH	-	-	5.32	23
APRIL	-	-	5.41	30
MAY	-	-	5.57	15
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

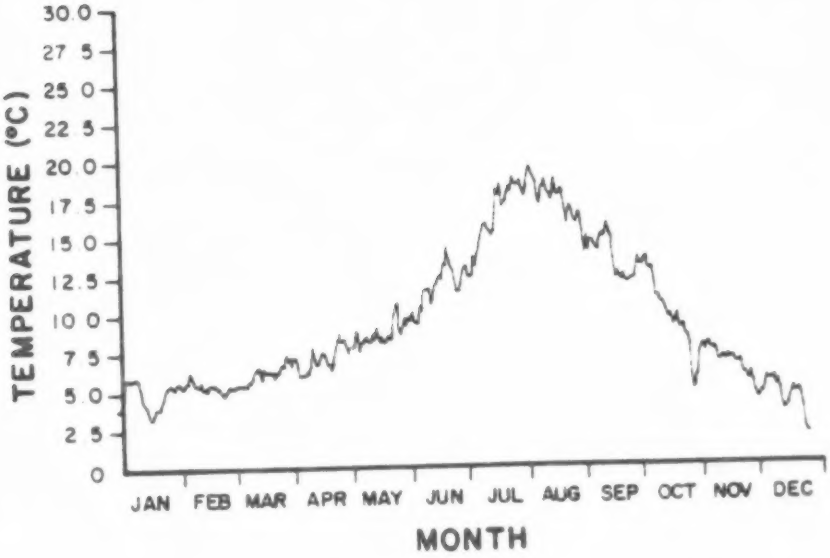
Chehalis River 1980



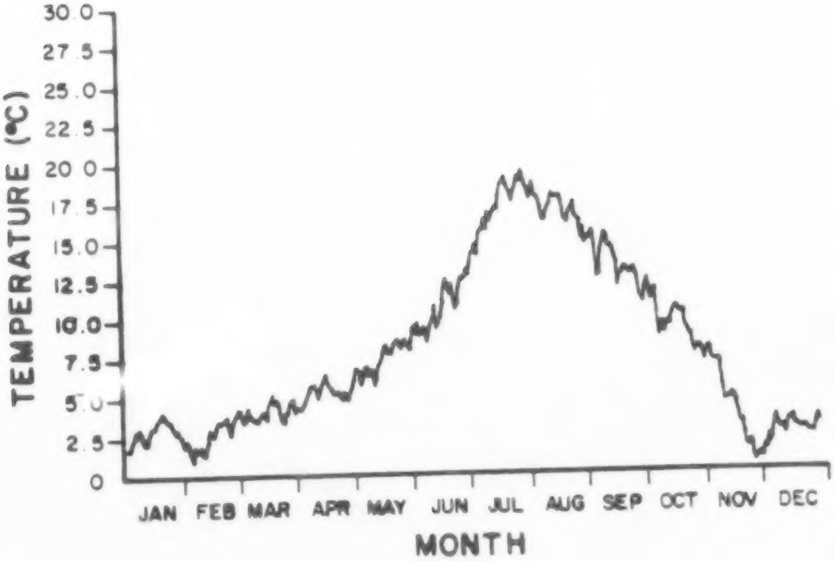
Chehalis River 1983

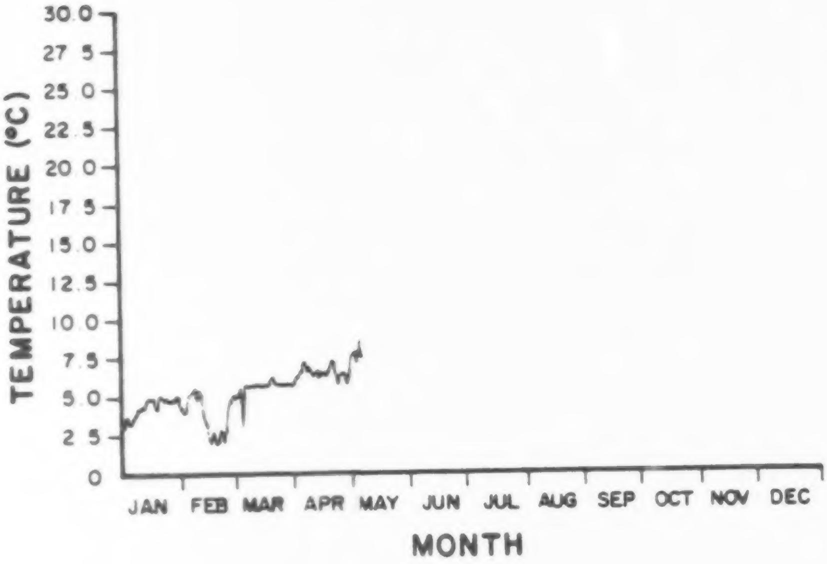


Chehalis River 1984

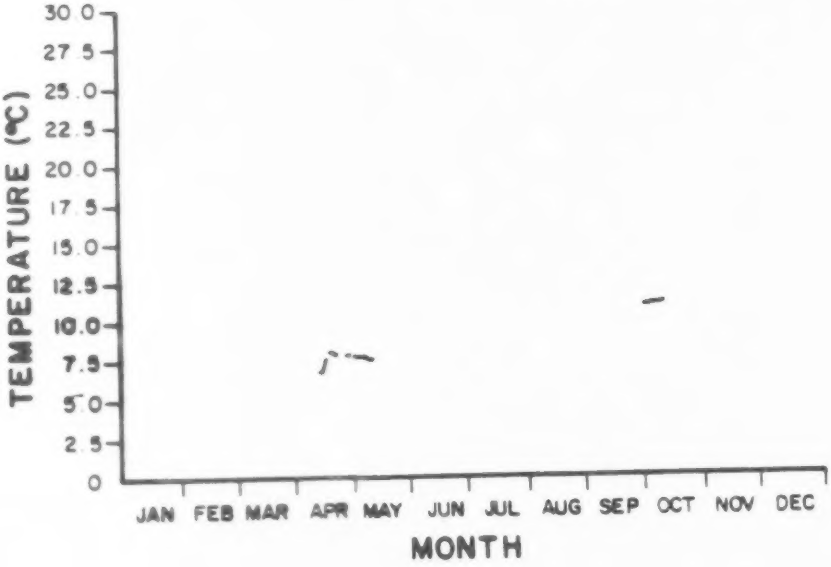


Chehalis River 1985





Chehalis River 1986



Well # 1 1983

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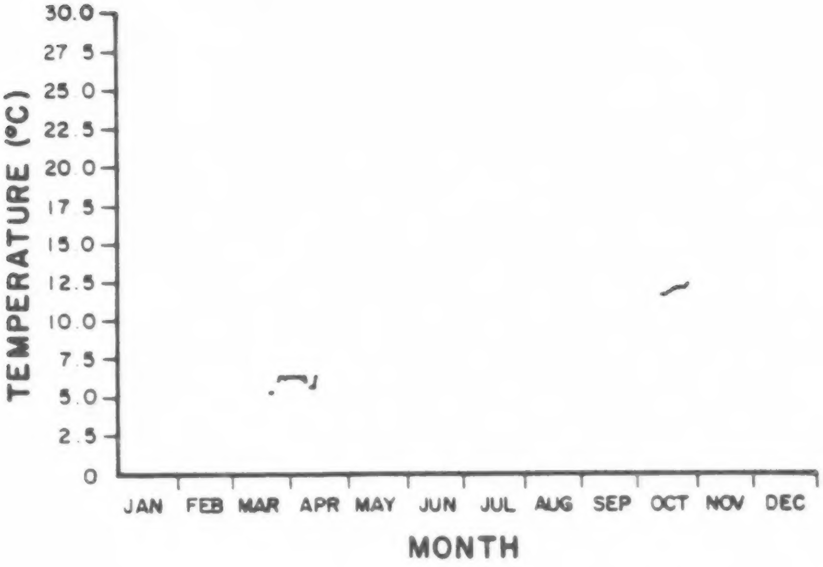
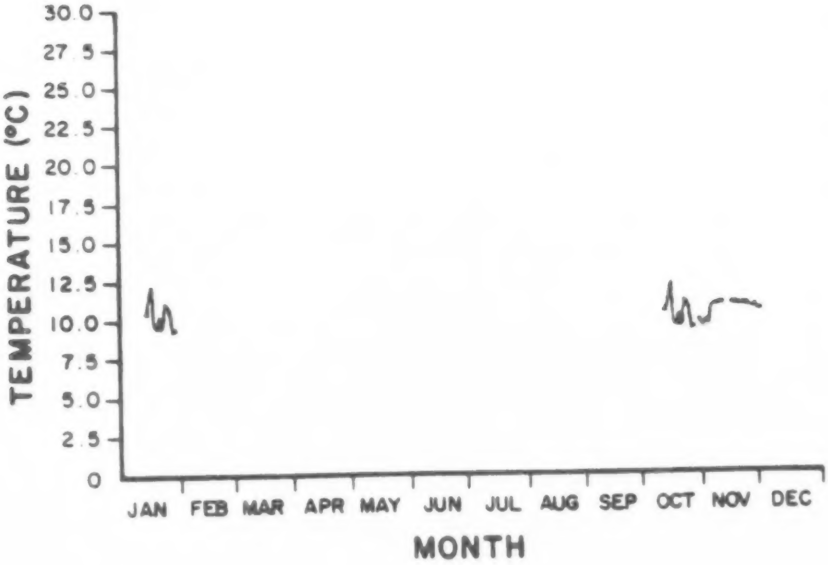
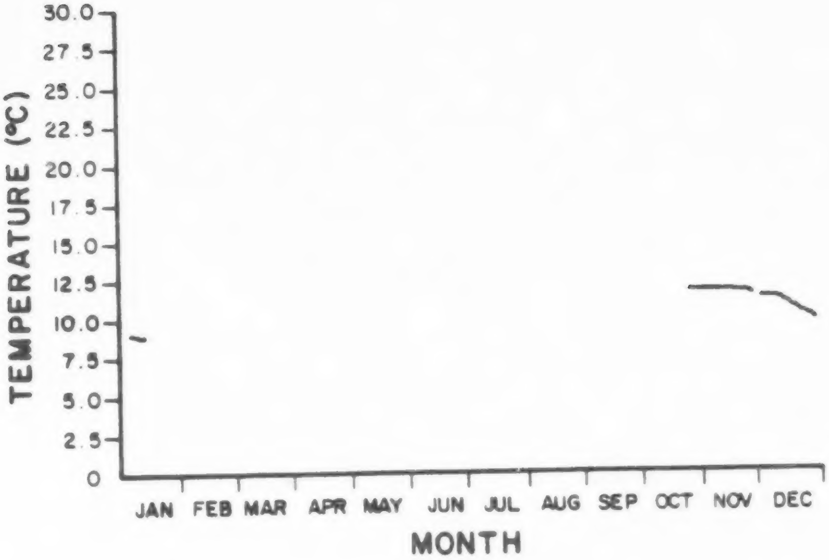
Well # 2 1983

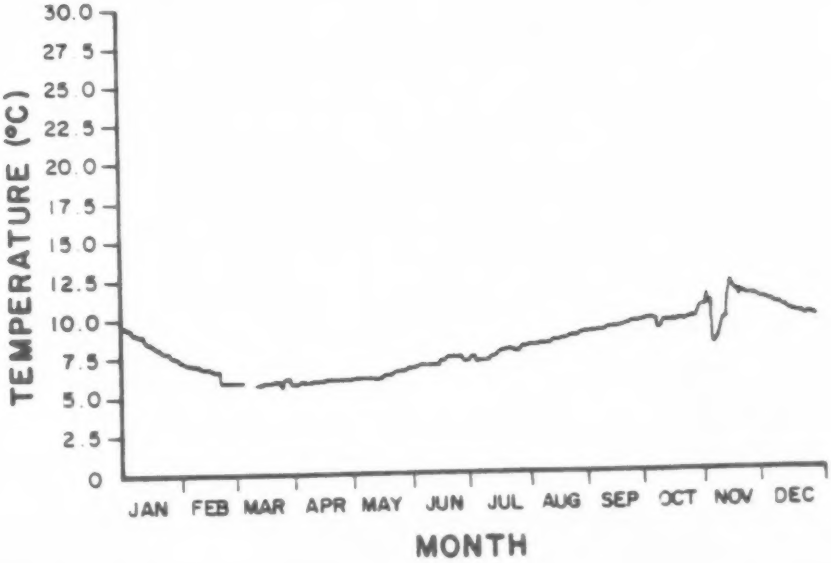


Mixed Wells 1982

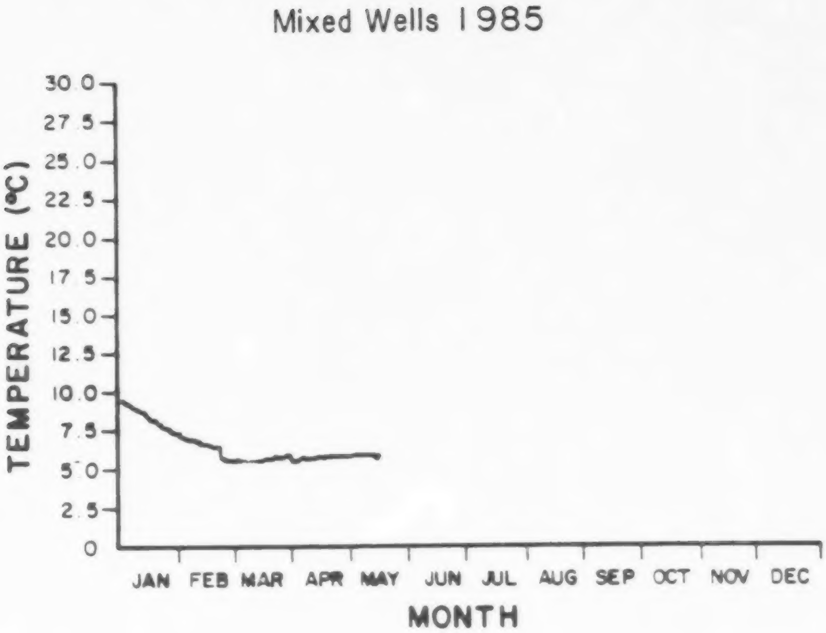




Mixed Wells 1983



Mixed Wells 1984


Mixed Wells 1985
TEMPERATURE (°C)
30.0
27.5
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH

Facility: **CHEMAINUS**

Location:

Located on the Chemainus River, north of Victoria on the east coast of Vancouver Island.

Description:

DFO has contracted with this private hatchery since 1979 to enhance the remnant Chemaius River chinook stock. The contract expanded to include coho stocks beginning in 1981. The hatchery is currently owned and operated by Sea Spring Salmon Farms. Egg capacity is 200 K chinook and 75 K coho. Eggs are obtained from the Chemainus River, and juveniles are released back into the Chemainus River.

Water Sources:

Surface. A reservoir, fed by a seasonal run stream on the back of Mount Sicar, one mile away, serves as a back up water supply.

Groundwater. Three wells on site supply all the hatchery water needs.

General Water Quality:

The water supplies are acceptable for hatchery purposes.

Special Note:

There are no daily temperature records available for the wells or the reservoir. Only tables of monthly mean provided are for mixed well water only.

WATER QUALITY VALUES FOR CHEMAINUS
[below detection limits = 0]

PARAMETERS	MAR28/84 WELL	MAR23/85 WELL	MAR28/84 RESER-VOIR	MAR23/85 RESER-VOIR
Alkalinity	22	22	29	45.5
Ammonia	0	0	.008	0
CO2				
Chloride	2.5	4.1	2.4	8
Color				
Conductivity Field				
Conductivity Lab	71.4	70	83.7	165
Dissolved O2-ppm				
Dissolved O2-%sat		63.22		75.24
Dissolved Gas Tot		95.55		98.65
Dissolved Nitrogen		104.17		104.9
Hardness	28.4	26.3	33.6	68.9
Nitrite	0	0	0	0
Nitrate	.7	.151	.42	2.52
pH-Field				
pH-Lab	6.7	6.5	7.1	7.1
Phosphate	0	.003	.009	.013
Residue Filterable	50	44	60	122
Residue Non-Filter	0	0	0	0
Silica	3.7	3.2	3.4	4
Sulphate	4.2	4	5.5	10
Taste				
Temperature		8.4		9.3
Turbidity	0	.13	.1	.78
METALS—				
Al-Aluminum	0	0	0	0
As-Arsenic	0	0	0	0
Ba-Barium	.01	.008	.004	.007
Ca-Calcium	9.5	8.8	11.8	23.5
Cd-Cadmium	0	0	0	0
Co-Cobalt	0	0	0	0
Cr-Chromium	0	0	0	0
Cu-Copper	.001	.001	.001	.002
Fe-Iron	0	0	.038	.105
Hg-Mercury		.0001	0	.00009
K—Potassium	.37	1.39	.22	.9
Mg-Magnesium	1.1	1.1	1.1	2.4
Mn-Manganese	0	0	.005	.012
Mo-Molybdenum	0	0	0	0
Na-Sodium	2.4	2.4	2.6	3.8
Ni-Nickle	0	0	0	0
P—Phosphorus	0	.003	0	.013
Pb-Lead	0	0	0	0
Sb-Antimony	0	0	0	0
Se-Selenium	0	0	0	0
Si-Silicon	3.7	3.2	3.4	4
Sn-Tin	0	.03	0	.01
Sr-Strontium	.033	.029	.023	.044
Ti-Titanium	0	0	0	0
V—Vanadium	0	0	0	0
Zn-Zinc	0	0	0	0

CHEMAINUS RIVER 1979

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY		NO DATA	
FEBRUARY		NO DATA	
MARCH		NO DATA	
APRIL		NO DATA	
MAY		NO DATA	
JUNE		NO DATA	
JULY		NO DATA	
AUGUST		NO DATA	
SEPTEMBER		NO DATA	
OCTOBER	-	-	10
NOVEMBER	-	-	9.9
DECEMBER	-	-	10

CHEMAINUS RIVER 1980

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	-	-	10
FEBRUARY	-	-	10.2
MARCH	-	-	10
APRIL	-	-	10.2
MAY	-	-	10.4
JUNE	-	-	10.2
JULY		NO DATA	
AUGUST		NO DATA	
SEPTEMBER		NO DATA	
OCTOBER	-	-	10
NOVEMBER	-	-	10.3
DECEMBER	-	-	10

CHEMAINUS RIVER 1981

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	-	-	10
FEBRUARY	-	-	10.4
MARCH	-	-	10.4
APRIL	-	-	10
MAY	-	-	10
JUNE	-	-	10.2
JULY		NO DATA	
AUGUST		NO DATA	
SEPTEMBER		NO DATA	
OCTOBER	-	-	10
NOVEMBER	-	-	10.2
DECEMBER	-	-	9

CHEMAINUS RIVER 1982

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	-	-	10
FEBRUARY	-	-	10.4
MARCH	-	-	10
APRIL	-	-	10
MAY	-	-	10
JUNE	-	-	10
JULY		NO DATA	
AUGUST		NO DATA	
SEPTEMBER		NO DATA	
OCTOBER	-	-	9.7
NOVEMBER	-	-	10
DECEMBER	-	-	10.5

CHEMAINUS RIVER 1983

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	-	-	10
FEBRUARY	-	-	10
MARCH	-	-	9.9
APRIL	-	-	9.8
MAY	-	-	9.5
JUNE	-	-	9.5
JULY		NO DATA	
AUGUST		NO DATA	
SEPTEMBER		NO DATA	
OCTOBER	-	-	8.8
NOVEMBER	-	-	8.5
DECEMBER	-	-	8.3

CHEMAINUS RIVER 1984

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	-	-	10
FEBRUARY	-	-	11.5
MARCH	-	-	10
APRIL	-	-	10
MAY	-	-	10
JUNE	-	-	10
JULY		NO DATA	
AUGUST		NO DATA	
SEPTEMBER		NO DATA	
OCTOBER	-	-	9.4
NOVEMBER	-	-	9.5
DECEMBER	-	-	9.7

CHEMAINUS RIVER 1985

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	-	-	10
FEBRUARY	-	-	10
MARCH	-	-	10
APRIL	-	-	10
MAY	-	-	10
JUNE	-	-	10
JULY		NO DATA	
AUGUST		NO DATA	
SEPTEMBER		NO DATA	
OCTOBER	-	-	9
NOVEMBER	-	-	9.2
DECEMBER	-	-	9.5

CHEMAINUS RIVER 1986

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	-	-	9.8
FEBRUARY	-	-	9.9
MARCH	-	-	10
APRIL		NO DATA	
MAY		NO DATA	
JUNE		NO DATA	
JULY		NO DATA	
AUGUST		NO DATA	
SEPTEMBER		NO DATA	
OCTOBER		NO DATA	
NOVEMBER		NO DATA	
DECEMBER		NO DATA	

Facility: CHILLIWACK

Location:

Located at the confluence of Slesse Creek and Chilliwack River, 19 km from the Vedder Crossing bridge and 32 km southeast of the city of Chilliwack.

Description:

Construction was completed in 1981, although the hatchery has slowly expanded, adding concrete rearing containers and adult capture and holding facilities. The hatchery, which combines conventional and Japanese-style technologies, was built to enhance the production of Chilliwack River stocks. Vedder River is the site of the largest sport fishery for steelhead in British Columbia.

Egg production targets for 1985 were 2.2 M coho, 2 M chinook, 4.2 M chum and 225 K steelhead. Eggs are obtained primarily from the Chilliwack River and its tributaries. Chinook eggs from the Pitt, Harrison, and upriver Fraser systems have been used to renew the remnant Chilliwack run (some juvenile chinook were released back into the Pitt River).

Water Sources:

Surface. The hatchery draws its surface water by gravity through a settling pond from the Chilliwack River.

Groundwater. Two wells (well #1 and well #2) are in use at the hatchery. A third well (well #3) is currently being tested for suitability.

General Water Quality:

Water temperature is manipulated by mixing river and well waters. Well #1 is somewhat high in ammonia, but no problems known to be associated with ammonia have developed. Silting is a problem with the river water supply.

Special Notes:

Well temperatures remain near 11°C year-round, thus tables and graphs of the temperatures are not included.

River temperatures are taken from the river intake, and from the coho and chum channels. No significant change in water temperature has been noted because of the settling pond.

WATER QUALITY VALUES FOR CHILLIWACK
(below detection limits = 0)

PARAMETERS	JAN05/77 CHILLIWACK RIVER	JAN20/77 CHWK RIVER	FEB01/77 CHWK RIVER	FEB15/77 CHWK RIVER	MAR01/77 CHWK RIVER	MAR15/77 CHWK RIVER	MAR29/77 CHWK RIVER	APR13/77 CHWK RIVER	APR26/77 CHWK RIVER	MAY25/77 CHWK RIVER	JUN29/77 CHWK RIVER
Alkalinity	15	16	19	18	18.5	19.2	20	16	13	15	12
Ammonia	.006	.007	0	0	0	.012	0	0	0	0	.008
CO2											
Chloride	0		0	0	.6		.5	.5	0	.6	0
Color											
Conductivity Field											
Conductivity Lab	56	44	51	46.4	50	52	54	46	35.4	41	34
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness											
Nitrite	0	0	0	0	0	0	0	0	0	0	0
Nitrate	.11	.15	.11	.1	.1	.1	.09	0	.46	.076	.066
pH-Field	7.7										
pH-Lab			7.5	7.4	7.4		7.4	7.4	7.1	7.1	
Phosphate	0	0	0	0	.039	0	0	0	.012	0	0
Residue Filterable	32	31	39	30	36	37	40	36	30	41	23
Residue Non-Filter	32	0	0	0	0	0	0	0	14	0	0
Silica	3	2.8	3.2	2.9	3.1	2.8	2.9	2.7	2.1	2.5	2.3
Sulphate	5	3.7	2.9	4.3	4.8	5	5.6	4	3.8	3.1	3.2
Taste											
Temperature											
Turbidity	0	2.1	.3	0	.65	.52	0	.99	3	.8	0
METALS—											
Al-Aluminum											
As-Arsenic											
Ba-Barium											
Ca-Calcium	6.9	6	6.5	6	6.6	7.2	7.4	6.5	4.3	5.4	4.9
Cd-Cadmium											
Co-Cobalt											
Cr-Chromium											
Cu-Copper		0		0		0		0		0	0
Fe-Iron		0		0		0		.04		0	0
Hg-Mercury											
K—Potassium	.52	.39	.48	.45	.44	.52	.53	.46	.36		.35
Mg-Magnesium	.04	.48	.54	.53	.57	.65	.65	.65	.39	.45	.4
Mn-Manganese											
Mo-Molybdenum											
Na-Sodium	.91	.76	.89	.78	.91	.92	1	.4	.68	.4	.68
Ni-Nickle											
P—Phosphorus											
Pb-Lead		0		0		0				0	0
Sb-Antimony											
Se-Selenium											
Si-Silicon								2.7	2.1	2.5	2.3
Sn-Tin											
Sr-Strontium											
Ti-Titanium											
V--Vanadium											
Zn-Zinc		0		.01		0				0	0

WATER QUALITY VALUES FOR CHILLIWACK
(below detection limits = 0)

PARAMETERS	JUL26/77 CHILLIWACK RIVER	AUG26/77 CHWK RIVER	SEP28/77 CHWK RIVER	OCT26/77 CHWK RIVER	NOV28/77 CHWK RIVER	JAN03/78 CHWK RIVER	FEB03/78 CHWK RIVER	MAR08/78 CHWK RIVER	APR07/78 CHWK RIVER	MAY11/78 CHWK RIVER	JUN12/78 CHWK RIVER
Alkalinity	15	13.7	17	14	15	16.7	18.5	18.3	4.5	13.7	10.7
Ammonia	0	0	0	.07	.009	.011	.01	0	0	0	0
CO2											
Chloride	.6	0	0	.7	.5	.5	0	.6	.55	0	0
Color											
Conductivity Field											
Conductivity Lab	36	38	48	42.6	43.5	0	53.9	51	45	40.4	31.8
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness							24.4		17.8	16.8	12.9
Nitrite	0	0	0	0	0	0	0	0	0	0	0
Nitrate	.014	.052	.064	.132	.13	.12	.109	.111	.144	.103	.067
pH-Field											
pH-Lab	7.2	7.4	7.3	7.3	7.3	7.3	7.3	7.5	7.4	7.4	7.2
Phosphate	0	.035	0	.01	0	0	0	0	0	0	0
Residue Filterable	29	28	34	35	34	36	38	42	36	33	27
Residue Non-Filter	0	0	0	7	5	0				0	0
Silica	2.3	2.5	2.6	2.4	2.7	3.1	2.95	2.8	2.93	2.6	2.5
Sulphate	3.5	5.8	4.1	4.4	3.2	6	5.23	4.51	4.5	4.79	3.9
Taste											
Temperature											
Turbidity	0	1.5	.7	1.9	2.8	0	0	.75	.75	.67	1
METALS—											
Al-Aluminum					0	0	0	0	0	0	0
As-Arsenic					0	0	0	0	0	0	0
Ba-Barium	.01				.0071	.0066	.0083	.006	.0074	.0069	.0061
Ca-Calcium	4.6	4.8	5.5				8.66	7.36	6.29	5.9	4.6
Cd-Cadmium					0	0	0	0	0	0	0
Co-Cobalt					0	0	0	0	0	0	0
Cr-Chromium					0	0	0	0	0	0	0
Cu-Copper										0	0
Fe-Iron		0		0	.024	0	0	0	0	.08	.096
Hg-Mercury					0	0	0	0	0	0	0
K—Potassium	.22	.24	.49	.53	.43	.48	.55	.479	.49	.45	.3
Mg-Magnesium	.46	.51	.59	.49	.56	.56	.67	.61	.51	.5	.345
Mn-Manganese					0	0	0	0	0	0	0
Mo-Molybdenum					0	0	0	0	0	0	0
Na-Sodium	.92	.63	.77	.79	.68	1	1.07	.98	.81	.82	.68
Ni-Nickle					0	0	0	0	0	0	0
P—Phosphorus	.45							0			
Pb-Lead										0	0
Sb-Antimony					0	0	0	0	0	0	0
Se-Selenium					0	0	0	0	0	0	0
Si-Silicon	2.3				2.6	3	3.18	2.8	2.21	2.71	1.73
Sn-Tin					0	0	0	0	0	0	0
Sr-Strontium	.03				.031	.031	.042	.0419	.0293	.0296	.0205
Ti-Titanium					0	0	0	0	0	0	0
V—Vanadium					0	0	0	0	0	0	0
Zn-Zinc		0		0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR CHILLIWACK
(below detection limits = 0)

PARAMETERS	JUL05/78 CHILLIWACK RIVER	AUG01/78 CHLWK RIVER	SEP08/78 CHLWK RIVER	OCT13/78 CHLWK RIVER	NOV20/78 CHLWK RIVER	DEC13/78 CHLWK RIVER	JAN15/79 CHLWK RIVER	DEC10/81 CHLWK RIVER	MAY21/82 CHLWK RIVER	OCT28/82 CHLWK RIVER	FEB20/85 CHLWK RIVER
Alkalinity	9.87	11.4	12.3	14.9	16.5	19.5	21.7	16.5	14	16	20
Ammonia	0	0	0	0	.005	.009	.007	.0098	.006	0	.01
CO2											
Chloride	0	0	0	.6	.55	.53	.55	.81	.6	.5	.09
Color											
Conductivity Field											
Conductivity Lab	30.8	33.5	38	45	45.4	54.5	60.5	48.4	42.5		58
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	11.7	13.1	15.5	19.3	18.8	25.5	26.8	18.7	16.6	17.3	24.3
Nitrite	0	0	0	0	0	0	0	0	.005		0
Nitrate	.06	.053	.058	.08	.103	.117	.129	.138	.12		.11
pH-Field											
pH-Lab	7.3	7.3	7.3	7.4	7.3	7.4	7.4	7.4	7.6		7.4
Phosphate	0	0	0	0	.0055	0	0	.0114	.015		.007
Residue Filterable	25	26	32	32	36	48	43		39	40	39
Residue Non-Filter	0	0	0	0	0	0	0		12	0	0
Silica	2.3	2.45	2.42	2.65	2.85	3.1	3.45		2.5		.7
Sulphate	3.25	3.75	6.05	4.7	4.5	5.71	6.4	5.6	5.5		6
Taste											
Temperature											
Turbidity	0	0	.43	0	.85	0	0		.7		0
METALS—											
Al-Aluminum	0	0	0	0	0	0	0	0	.07	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.0046	.0058	.0058	.007	.0058	.0088	.0087	.0073	.006	.007	.009
Ca-Calcium	4.04	4.54	5.36	6.79	6.51	8.88	9.26	6.54	5.6	5.9	8.5
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	.0041	0	0	0
Fe-Iron	.052	.037	.117	0	.045	.023	0	.0286	.071	.069	.048
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K—Potassium	.384	.5	.444	.515	.52	.564	.627	.465	.51	.5	.6
Mg-Magnesium	.38	.43	.519	.568	.621	.809	.896	.58	.5	.5	.7
Mn-Manganese	0	0	0	0	0	0	0	.0018	.003	.004	.001
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	.77	.74	.79	1.05	.7	.9	.85	1	.9	.9	1.1
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus			0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	.066	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon		2.45	2.33	2.69	2.62	3.29	3.29	2.81	2.6	2.5	.7
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.0203		.245	.0332	.0341	.0439	.466	.0351	.028	.031	.041
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	.0057	0	.003	0

WATER QUALITY VALUES FOR CHILLIWACK
[below detection limits = 0]

PARAMETERS	MAR11/70 WELL # 1	JAN05/77 WELL # 1	JAN20/77 WELL # 1	FEB01/77 WELL # 1	FEB15/77 WELL # 1	MAR01/77 WELL # 1	MAR15/77 WELL # 1	MAR29/77 WELL # 1	APR13/77 WELL # 1	APR26/77 WELL # 1	MAY25/77 WELL # 1
Alkalinity	98	58	61	62	59	62.8	63.1	64	63	68	66
Ammonia		.033	.055	.057	.054	.063	.072	.051	.056	.051	.05
CO2											
Chloride	.5	2		2	2.1	2.1		2	2.2	0	2
Color											
Conductivity Field											
Conductivity Lab		163	170	165	164	164	163	163	167	166	165
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness											
Nitrite		0	0	0	0	0	0	0	0	0	0
Nitrate		0	.01	0	0	0	0	0	0	0	0
pH-Field	8.1	8									
pH-Lab				8	8.3	8.4		8.4	8.4	8.3	8
Phosphate		.23	.18	.17	.18	.21	.18	.18	.15	.18	.19
Residue Filterable		107	100	106	102	103	104	106	105	107	105
Residue Non-Filter		107	0	0	0	0	0	0	0	0	0
Silica		6.8	6.4	6.8	6.5	6.6	5.7	5.8	5.8	5.8	5.2
Sulphate	2.4	15	15	16	14	16	16	16	14	16	15
Taste											
Temperature											
Turbidity	17	0	0	.2	0	0	0	0	0	.8	0
METALS—											
Al-Aluminum											
As-Arsenic											
Ba-Barium											
Ca-Calcium	27	23	21	22	22	22	23	23	20	23	24
Cd-Cadmium											
Co-Cobalt											
Cr-Chromium											
Cu-Copper	0		0		0		0		0		0
Fe-Iron	.04		0		0		0		0		0
Hg-Mercury											
K--Potassium	.9	.6	1.7	1.7	1.7	1.6	1.9	1.6	1.7	1.5	
Mg-Magnesium	2	1.8	1.3	1.3	1.4	1.3	1.4	1.4	1.3	1.4	1.3
Mn-Manganese	0										
Mo-Molybdenum											
Na-Sodium	8.4	7.1	6.6	6.7	6.9	6.8	7.1	6.7	7.2	6.8	6.8
Ni-Nickle											
P--Phosphorus											
Pb-Lead	0		0		0		0				0
Sb-Antimony											
Se-Selenium											
Si-Silicon									5.8	5.8	5.2
Sn-Tin											
Sr-Strontium											
Ti-Titanium											
V--Vanadium											
Zn-Zinc	0		0		.02		0				0

WATER QUALITY VALUES FOR CHILLIWACK
(below detection limits = 0)

PARAMETERS	JUN29/77 WELL # 1	JUL26/77 WELL # 1	AUG26/77 WELL # 1	SEP28/77 WELL # 1	OCT26/77 WELL # 1	NOV28/77 WELL # 1	JAN03/78 WELL # 1	FEB03/78 WELL # 1	MAR08/78 WELL # 1	APR07/78 WELL # 1	MAY11/78 WELL # 1
Alkalinity	61	62	61.3	64	62	61	48.3	61.3	62.1	15.8	64
Ammonia	.05	.05	.051	.052	.046	.052	.013	.068	.0561	.0514	.0535
CO2											
Chloride	2.1	2.5	2.3	2.2	2.1	2.2	2.4	2	2.15	2.17	2.23
Color											
Conductivity Field											
Conductivity Lab	170	170	163	170	165	165	0	168	161	165	167
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness								63.9		53.4	66.8
Nitrite	0	0	0	0	0	0	0	0	0	0	0
Nitrate	0	0	0	0	.4	.015	.21	.015	0	.016	0
pH-Field											
pH-Lab		8.3	8.2	8	8.3	8.3	7.8	8.1	8.3	8.3	8.3
Phosphate	.16	.49	.17	.17	.17	.15	.047	.163	.162	.017	.192
Residue Filterable	114	108	100	110	110	110	100	107	106	108	106
Residue Non-Filter	0	0	0	0	0	0	0				0
Silica	5.7	5.8	5.6	5.5	6	6	5.1	5.85	5.88	6	5.42
Sulphate	16	16	16	16	15.7	15	12	14.8	15.9	15.8	18
Taste											
Temperature											
Turbidity	0	0	1	0	0	0	0	0	0	0	0
METALS—											
Al-Aluminum						0	0	0	0	0	0
As-Arsenic						0	0	0	0	0	0
Ba-Barium		.01				.014	.0094	.0145	.0121	.0107	.0123
Ca-Calcium	25	23	22	23				23.9	24	23.3	24.5
Cd-Cadmium						0	0	0	0	0	0
Co-Cobalt						0	0	0	0	0	0
Cr-Chromium						0	0	0	0	0	0
Cu-Copper	0										0
Fe-Iron	0		0		0	.015	0	0	0	0	0
Hg-Mercury						0	0	0	0	0	0
K—Potassium	1.3	1.1	.91	1.7	1.7	1.6	1.45	1.3	1.79	1.7	1.7
Mg-Magnesium	1.51	1.5	1.4	1.4	1.4	1.5	1.4	1	1.41	1.27	1.36
Mn-Manganese						.013	0	.0125	.0114	.0112	.0133
Mo-Molybdenum						0	0	0	0	0	0
Na-Sodium	7.89	8.7	6.6	6.8	6.8	6.6	4	6.5	9.23	7.01	5.86
Ni-Nickle						0	0	0	0	0	0
P—Phosphorus		.54							.64		
Pb-Lead	0										0
Sb-Antimony						0	0	0	0	0	0
Se-Selenium						0	0	0	0	0	0
Si-Silicon	5.7	6				5.9	5.1	6.19	5.88	4.59	5.71
Sn-Tin						0	0	0	0	0	0
Sr-Strontium		.12				.12	.089	.127	.126	.104	.114
Ti-Titanium						0	0	0	0	0	0
V--Vanadium						0	0	0	0	0	0
Zn-Zinc	0		0		.02	0	0	0	0	0	0

WATER QUALITY VALUES FOR CHILLIWACK
(below detection limits = 0)

PARAMETERS	JUN12/78 WELL # 1	JUL05/78 WELL # 1	AUG01/78 WELL # 1	SEP08/78 WELL # 1	OCT13/78 WELL # 1	NOV7/78 WELL # 1	NOV16/78 WELL # 1	NOV20/78 WELL # 1	DEC13/78 WELL # 1	JAN15/79 WELL # 1	MAY19/81 WELL # 1
Alkalinity	62.5	64.6	62.4	61.3	62.9		78.4	68.5	68.7	72.9	68
Ammonia	.048	.053	.0532	.0481	.0595			.0578	.0633	.058	.005
CO2											
Chloride	2.25	2.3	2	2.13	2.3		2	2.05	1.85	1.6	3.6
Color											
Conductivity Field											
Conductivity Lab	186	163	165	165.4	175		171	184	179	191	189
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	63.4	66.2	66.5	68.4	73.6	72.6	58.7	71.2	76.9	81.8	85.2
Nitrite	0	0	0	0	0			0	0	0	0
Nitrate	0	0	0	0	0		.009	0	0	0	2.04
pH-Field							8.3				
pH-Lab	8.4	8.3	8.4	8.2	8.3			8.2	8.2	8.1	7
Phosphate	.119	.2	.1625	.16	.155		.52	.16	.16	.158	0
Residue Filterable	104	107	111	107	115			120	123	124	124
Residue Non-Filter	0	0	0	0	0			0	0	0	0
Silica	6.05	5.75	7.4	5.9	5.6			5.89	5.95	6.15	5.44
Sulphate	17.2	15.3	16	16.6	19		14	18.7	20.1	20.4	12.6
Taste											
Temperature											
Turbidity	0	0	0	.18	0		.13	0	0	0	0
METALS—											
Al-Aluminum	0	0	0	0	0	0		0	0	0	0
As-Arsenic	0	0	0	0	0	0		0	0	0	0
Ba-Barium	.013	.0117	.0123	.012	.0144	.0138		.01	.01	.0161	.0248
Ca-Calcium	23.5	24.2	24.3	24.8	26.8	26.1	21.3	25.7	27.8	29.4	28.3
Cd-Cadmium	0	0	0	0	0	0		0	0	0	0
Co-Cobalt	0	0	0	0	0	0		0	0	0	0
Cr-Chromium	0	0	0	0	0	0		0	0	0	0
Cu-Copper	0	0	0	0	0	.035	.001	0	0	0	0
Fe-Iron	0	0	0	0	0	.046	0	0	0	.056	.0196
Hg-Mercury	0	0	0	0	0	0		0	0	0	0
K—Potassium	1.6	1.75	1.6	1.77	1.82		1.55	1.9	1.91	1.93	1.23
Mg-Magnesium	1.14	1.4	1.41	1.58	1.62	1.81	1.29	1.7	1.82	2.04	3.53
Mn-Manganese	.0115	.0111	.0124	.0122	.0108	.0143	.011	.0125	.0126	.0141	0
Mo-Molybdenum	0	0	0	0	0	0		0	0	0	0
Na-Sodium	7.25	6.98	6.62	7.04	7	6.27	7.26	6.58	7.44	7.84	3.24
Ni-Nickle	0	0	0	0	0	0		0	0	0	0
P—Phosphorus				0	0	0		0	0	0	0
Pb-Lead	0	0	0	0	0	0	.005	0	0	0	0
Sb-Antimony	0	0	0	0	0	0		0	0	0	0
Se-Selenium	0	0	0	0	0	0		0	0	0	0
Si-Silicon	4.53	5.75	7.4	5.43	5.7	4.95		5.22	6.21	5.85	5.45
Sn-Tin	0	0	0	0	0	0		0	0	0	0
Sr-Strontium	.114	.12		.119	.128	.135		.132	.143	.154	.137
Ti-Titanium	0	0	0	0	0	0		0	0	0	.0061
V—Vanadium	0	0	0	0	0	0		0	0	0	0
Zn-Zinc	0	0	0	0	0	0	.029	0	0	0	.027

WATER QUALITY VALUES FOR CHILLIWACK
(below detection limits = 0)

PARAMETERS	DEC10/81 WELL # 1	OCT28/82 WELL # 1	FEB08/84 WELL # 1	FEB21/85 WELL # 1	JUL04/85 14:00 HR WELL #1	JUL17/70 WELL # 2	JAN05/77 WELL # 2	JAN20/77 WELL # 2	FEB01/77 WELL # 2	FEB15/77 WELL # 2	MAR01/77 WELL # 2
Alkalinity	68.7	72		73.7	76.1	60	51	50	50	49.5	51
Ammonia	.005	.043		.052	.054		0	0	0	0	0
CO2											
Chloride	2.06	2.1		2.2	3.1		2.2		2.2	2.3	2.3
Color											
Conductivity Field					145						
Conductivity Lab	187	10		205	200		130	149	138	136	134
Dissolved O2-ppm					.35						
Dissolved O2-%sat					3.3						
Dissolved Gas Tot					101.2						
Dissolved Nitrogen					127.2						
Hardness	68.2	73.8	56.6	86.1	85	60.5					
Nitrite	0	0		0	.006		0	0	0	0	0
Nitrate	.0124	.01		0	.009		0	0	0	0	0
pH-Field	8.3	8.3		8.2	8.5	7.7	8.6				
pH-Lab					8.1				7.9	8	8.1
Phosphate	.16	.225		.24	.148		.04	.05	.046	.041	.047
Residue Filterable					116		84	84	88	80	87
Residue Non-Filter					0		84	0	0	0	0
Silica							5.6	5.6	5.7	5.5	5.6
Sulphate	19	17.9		21	18	20.4	11	12	12	11	12
Taste					OK						
Temperature					11.2						
Turbidity		0		0	0	1	0	0	.2	0	0
METALS—											
Al-Aluminum	0	0	0	0	0						
As-Arsenic					0						
Ba-Barium					.016						
Ca-Calcium	24.8	26.9	20.4	31.3	31.1	20.9	20	19	20	19	19
Cd-Cadmium	0	0	0	0	0						
Co-Cobalt					0						
Cr-Chromium					0						
Cu-Copper	0	0	0	0	0	0		0		0	
Fe-Iron	0	.008	0	0	.008	.06		0		0	
Hg-Mercury	0	0		0	0						
K—Potassium		2.09	1.5	1.79	1.84	1.3	1.3	1.3	1.3	1.3	1.3
Mg-Magnesium	1.53	1.6	1.3	1.9	1.7	2	1.6	1.3	1.2	1.2	1.2
Mn-Manganese	.0134	.012	.01	.015	.016	0					
Mo-Molybdenum					.011						
Na-Sodium	8.4	8.3	5.4	7.5	7.5	5.6	3.4	3.4	3.4	3.4	3.3
Ni-Nickle					0						
P—Phosphorus					.17						
Pb-Lead	0	0	0	0	0	0		0		0	
Sb-Antimony					0						
Se-Selenium					0						
Si-Silicon					5.3						
Sn-Tin					.02						
Sr-Strontium					.141						
Ti-Titanium					0						
V--Vanadium					0						
Zn-Zinc	0	0	0	0	0	0		0		.02	

WATER QUALITY VALUES FOR CHILLIWACK
(below detection limits = 0)

PARAMETERS	MAR15/77 WELL # 2	MAR29/77 WELL # 2	APR13/77 WELL # 2	APR26/77 WELL # 2	MAY25/77 WELL # 2	JUN29/77 WELL # 2	JUL26/77 WELL # 2	AUG26/77 WELL # 2	SEP28/77 WELL # 2	OCT26/77 WELL # 2	NOV28/77 WELL # 2
Alkalinity	50.7	52	51	55	50	50	50	49.5	50	50	49
Ammonia	.012	0	0	0	0	0	0	.005	0	0	.014
CO2											
Chloride		2.2	2.3	0	2.4	2.3	2.8	2.3	2.4	2.5	2.4
Color											
Conductivity Field											
Conductivity Lab	134	135	135	136	136	140	140	138	137	137	135
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness											
Nitrite	0	0	0	0	0	0	0	0	0	0	0
Nitrate	0	0	0	0	0	0	0	0	0	0	.17
pH-Field											
pH-Lab		8.1	8.1	8.2	7.7		8.1	8.1	8	8.1	8.1
Phosphate	.052	.047	.043	.046	.051	.045	.046	.055	.042	.049	.045
Residue Filterable	87	88	888	87	88	96	86	85	86	87	88
Residue Non-Filter	0	0	0	0	0	0	0	0	0	0	0
Silica	4.9	4.9	4.9	4.9	4.8	4.4	4.9	4.9	4.7	5.1	5.2
Sulphate	12	11	12	13	12	12	13	12	12	11.4	12
Taste											
Temperature											
Turbidity	0	0	0	.5	0	0	0	1	0	0	0
METALS—											
Al-Aluminum											0
As-Arsenic											0
Ba-Barium							.01				.022
Ca-Calcium	21	19	20	20	21	20	20	20	19		
Cd-Cadmium											0
Co-Cobalt											0
Cr-Chromium											0
Cu-Copper	0		0		0	0					
Fe-Iron	0		0		0	0		0		0	.01
Hg-Mercury											0
K—Potassium	1.4	1.3	1.3	1.2		1	.85	.86	1.3	1.3	1.3
Mg-Magnesium	1.3	1.3	1.3	1.4	1.2	1.3	1.4	1.3	1.2	1.3	1.5
Mn-Manganese											0
Mo-Molybdenum											0
Na-Sodium	3.5	3.3	3.1	3.5	1.2	2.8	4.4	3.2	3.3	3.7	3.2
Ni-Nickle											0
P—Phosphorus							.47				
Pb-Lead	0				0	0					
Sb-Antimony											0
Se-Selenium											0
Si-Silicon			4.9	4.9	4.8	4.4	5.1				5.1
Sn-Tin											0
Sr-Strontium							.09				.087
Ti-Titanium											0
V—Vanadium											0
Zn-Zinc	0				0	0		0		.01	0

WATER QUALITY VALUES FOR CHILLIWACK
(below detection limits = 0)

PARAMETERS	JAN03/78 WELL # 2	FEB03/78 WELL # 2	MAR08/78 WELL # 2	APR07/78 WELL # 2	MAY11/78 WELL # 2	JUN12/78 WELL # 2	JUL05/78 WELL # 2	AUG01/78 WELL # 2	SEP08/78 WELL # 2	OCT13/78 WELL # 2	NOV07/78 WELL # 2
Alkalinity	61.1	50.3	50.5	12.3	50.2	49.8	47	49.7	48.9	48.5	
Ammonia	.08	.011	.01	0	.005	0	0	0	0	0	
CO2											
Chloride	2.4	2.3	2.48	2.53	2.55	2.6	2.55	2.28	2.37	2.65	
Color											
Conductivity Field											
Conductivity Lab	0	136	135	135	138	137	138	136	136	138	
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness		56.1		55.8	59.5	55.8	57	58	59.9	62	57.4
Nitrite	0	0	0	0	0	0	0	0	0	0	
Nitrate	.19	0	0	.013	0	0	0	0	0	0	
pH-Field											
pH-Lab	8.1	8.1	8.2	8.1	8.1	8.2	8.2	8.2	8.1	8.1	
Phosphate	.16	.0514	.0528	.0525	.0511	.044	.051	.0465	.0493	.05	
Residue Filterable	110	85	84	90	86	88	86	88	87	90	
Residue Non-Filter	0				0	0	0	0	0	0	
Silica	6	5	5	5.12	5.1	5.2	5	5.08	5.05	4.75	
Sulphate	16	11.1	11.8	12.3	14	13.6	12.2	13.3	12.1	13.5	
Taste											
Temperature											
Turbidity	0	0	0	0	0	0	0	0	.1	0	
METALS—											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.013	.0101	.0106	.008	.0088	.0082	.0084	.0088	.0082	.0103	.0075
Ca-Calcium		19.8	21.5	20.4	21.6	20.6	20.7	21.1	21.6	22.4	20.6
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper					0	0	0	0	0	0	0
Fe-Iron	0	0	.162	0	0	0	0	0	.026	0	0
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K—Potassium	1.69	.9	1.42	1.3	1.4	1.4	1.38	1.1	1.39	1.41	
Mg-Magnesium	1.5	1.6	1.5	1.17	1.34	1.06	1.28	1.3	1.45	1.47	1.45
Mn-Manganese	.012	0	.0369	0	0	0	0	0	0	0	0
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	7.5	3	3.4	3.55	3.05	3.28	3.52	3.4	3.78	3.2	3.35
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus			.45						0	0	0
Pb-Lead					0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	6	5.31	5	3.93	4.97	3.69	5	5.08	4.76	4.82	4.58
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.12	.0941	.111	.0746	.086	.0831	.0865		.0849	.09	.0893
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V--Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	.332	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR CHILLIWACK
(below detection limits = 0)

PARAMETERS	NOV16/78 WELL # 2	NOV20/78 WELL #2	DEC13/78 WELL #2	JAN15/79 WELL #2	DEC09/81 WELL # 2	MAY21/82 WELL # 2	OCT28/82 WELL # 2	FEB08/84 WELL # 2	FEB21/85 WELL # 2	JUL04/85 12:00 WELL 2	JUN30/85 48 HRS WELL #3
Alkalinity	63.6	52	50.7	49.9	53.6	52	57		55.8	56.4	82.3
Ammonia		0	.005	0	.008	.009	.005		.011	.012	.037
CO2											
Chloride	2	2.65	2.4	2.45	2.47	2.6	2.5		2.4	3.1	2.4
Color											
Conductivity Field										105	
Conductivity Lab	8.2	136	136	136	150	145.4	146		153	145	180
Dissolved O2-ppm										.2	
Dissolved O2-%sat										1.9	
Dissolved Gas Tot										103.4	
Dissolved Nitrogen										130.4	
Hardness	52.9	57.5	64.2	61.7	58.6	58.2	61.5	58.8	65.3	63	109
Nitrite		0	0	0	0	0	0		0	.008	.008
Nitrate	.012	0	0	0	0	0	0		0	.002	.014
pH-Field					8.3	8.2	8.2		8.1	8.45	8.2
pH-Lab		8.2	8.1	8						8.1	
Phosphate	.18	.049	.0505	.047	.05	.069	.069		.092	.088	.051
Residue Filterable		89	94	89						94	
Residue Non-Filter		0	0	0						0	
Silica		5.1	5.1	5.1							
Sulphate	12	13.7	16.3	13.8	13.7	13	12.9		13	12	16
Taste										OK	
Temperature										11.7	
Turbidity	.1	0	0	0		0	0		0	0	150
METALS—											
Al-Aluminum		0	0	0	0	0	0	.13	0	0	3.29
As-Arsenic		0	0	0						0	
Ba-Barium		.0081	.0097	.0092						.01	
Ca-Calcium	19	20.6	23	22	21.1	20.8	22.2	20.9	23.6	22.9	30.4
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt		0	0	0						0	
Cr-Chromium		0	0	0						0	
Cu-Copper	.001	0	0	0	.155	0	0	0	0	0	.154
Fe-Iron	0	0	0	.121	.0572	.008	.006	.135	0	.005	2.76
Hg-Mercury		0	0	0	0	0	0		0	0	.00008
K—Potassium	1.25	1.45	1.42	1.34	1.39	1.51	1.82	1.51	1.57	.86	5.8
Mg-Magnesium	1.29	1.46	1.65	1.64	1.44	1.5	1.4	1.3	1.5	1.4	2.3
Mn-Manganese	.004	0	0	0	.0077	.005	.007	.024	.007	.007	.216
Mo-Molybdenum		0	0	0						.006	
Na-Sodium	3.66	2.98	3.16	3.09	4.51	4.8	4.6	5.5	4.5	4.8	4
Ni-Nickle		0	0	0						0	
P—Phosphorus		0	0	0						.08	
Pb-Lead	.005	0	0	0	.51	0	0	0	0	0	.021
Sb-Antimony		0	0	0						0	
Se-Selenium		0	0	0						0	
Si-Silicon		4.54	5.22	4.85						4.5	
Sn-Tin		0	0	0						.01	
Sr-Strontium		.0879	.0957	.0951						.091	
Ti-Titanium		0	0	0						0	
V—Vanadium		0	0	0						0	
Zn-Zinc	.028	0	0	0	.0629	0	0	0	0	0	.003

WATER QUALITY VALUES FOR CHILLIWACK
(below detection limits = 0)

PARAMETERS	JUL01/85 72 HRS WELL #3	JUL08/85 23 HRS WELL #3	JUL08/85 70 HRS WELL #3	JUL08/85 WELL # 3
Alkalinity	62	62.4	82.4	57.5
Ammonia	.012	.006	.008	
CO2				
Chloride	2	1.5	1.8	1.14
Color				
Conductivity Field				
Conductivity Lab	155	160	160	158
Dissolved O2-ppm				
Dissolved O2-%sat				
Dissolved Gas Tot				
Dissolved Nitrogen				
Hardness	72.3	76.4	76.8	72.1
Nitrite	.007	.012	.005	
Nitrate	0	.007	.005	
pH-Field	8.1	8.2	8.2	8.2
pH-Lab				
Phosphate	.056	.034	.031	
Residue Filterable				
Residue Non-Filter				
Silica				
Sulphate	15	15	15	13.6
Taste				
Temperature				
Turbidity	3.5	.18	.2	
METALS—				
Al-Aluminum	.09	0	0	.07
As-Arsenic				
Ba-Barium				
Ca-Calcium	26.4	28.3	28.5	25.5
Cd-Cadmium	0	0	0	0
Co-Cobalt				
Cr-Chromium				
Cu-Copper	.015	.001	0	0
Fe-Iron	.118	.036	0	.0319
Hg-Mercury	0	0	0	
K—Potassium	1.24	1.18	1.24	1.1
Mg-Magnesium	1.3	1.3	1.3	1.4
Mn-Manganese	.015	.013	.012	.013
Mo-Molybdenum				
Na-Sodium	3.8	3.7	3.7	3.59
Ni-Nickle				
P—Phosphorus				
Pb-Lead	0	.003	0	0
Sb-Antimony				
Se-Selenium				
Si-Silicon				
Sn-Tin				
Sr-Strontium				
Ti-Titanium				
V—Vanadium				
Zn-Zinc	.03	0	0	.0013

CHILLIWACK RIVER 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	NO DATA			
FEBRUARY	NO DATA			
MARCH	NO DATA			
APRIL	NO DATA			
MAY	NO DATA			
JUNE	NO DATA			
JULY	NO DATA			
AUGUST	NO DATA			
SEPTEMBER	NO DATA			
OCTOBER	NO DATA			
NOVEMBER	-	-	6	4
DECEMBER	-	-	5.82	31

CHILLIWACK RIVER 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	5.82	31
FEBRUARY	-	-	4.03	28
MARCH	-	-	5.87	31
APRIL	-	-	6.22	30
MAY	-	-	7.98	31
JUNE	-	-	9.75	30
JULY	-	-	12.04	31
AUGUST	-	-	15.08	31
SEPTEMBER	-	-	12.43	30
OCTOBER	-	-	8.7	31
NOVEMBER	-	-	7.14	29
DECEMBER	-	-	5.08	30

CHILLIWACK RIVER 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3	5	3.96	28
FEBRUARY	2.3	4.5	4.18	28
MARCH	-	-	5.21	28
APRIL	-	-	5.52	28
MAY	-	-	7.11	20
JUNE	9.9	13	9.99	23
JULY	10.8	11.7	10.66	15
AUGUST	12.5	15.4	12.85	12
SEPTEMBER	11.2	13.8	11.86	25
OCTOBER	7	9.8	9.04	21
NOVEMBER	3.5	11.5	5.63	21
DECEMBER	3	7.7	4.54	25

CHILLIWACK RIVER 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	4.55	29
FEBRUARY	-	-	4.74	24
MARCH	5.4	6.2	5.56	30
APRIL	-	-	6.11	15
MAY	6.8	13.1	8.31	24
JUNE	-	-	9.76	12
JULY	-	-	11.31	28
AUGUST	-	-	13.15	29
SEPTEMBER	-	-	10.82	24
OCTOBER	-	-	8.03	30
NOVEMBER	-	-	7.06	26
DECEMBER	-	-	3.58	31

CHILLIWACK RIVER 1984

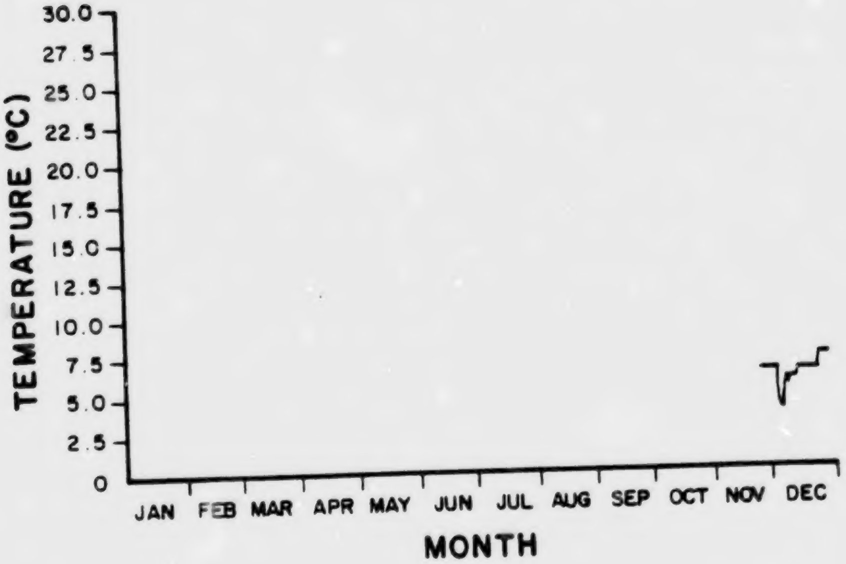
MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	4.01	31
FEBRUARY	-	-	4.46	26
MARCH	-	-	5.37	30
APRIL	-	-	6.07	29
MAY	-	-	7.03	27
JUNE	9.3	11.5	9.18	27
JULY	9.6	15.5	11.89	27
AUGUST	11.6	15.7	13.74	29
SEPTEMBER	8.5	12.8	10.97	30
OCTOBER	6.8	11.4	8.82	27
NOVEMBER	6	7	6.1	27
DECEMBER	2	4.8	3.79	28

CHILLIWACK RIVER 1985

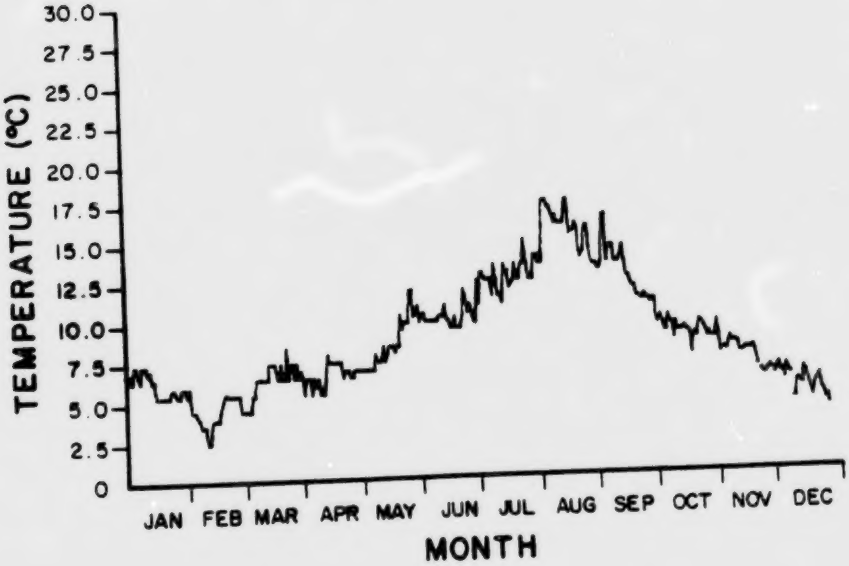
MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	3.83	31
FEBRUARY	-	-	3.6	28
MARCH	3.3	4.3	4.72	30
APRIL	5.6	6.1	5.77	29
MAY	6.7	7.5	7.02	17
JUNE	8.4	11.7	9.56	27
JULY	10.7	15.8	13.73	24
AUGUST	12.6	15.5	13.48	26
SEPTEMBER	8.7	12.2	11.03	28
OCTOBER	6.7	9.3	8.55	31
NOVEMBER	1	7	4.72	27
DECEMBER	4	7.4	4.57	27

CHILLIWACK RIVER 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	4	5.7	4.55	30
FEBRUARY	1.7	5.5	3.86	28
MARCH	4.2	6.4	5.4	31
APRIL	5.1	8	6.27	28
MAY	6.2	7	7.25	22
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

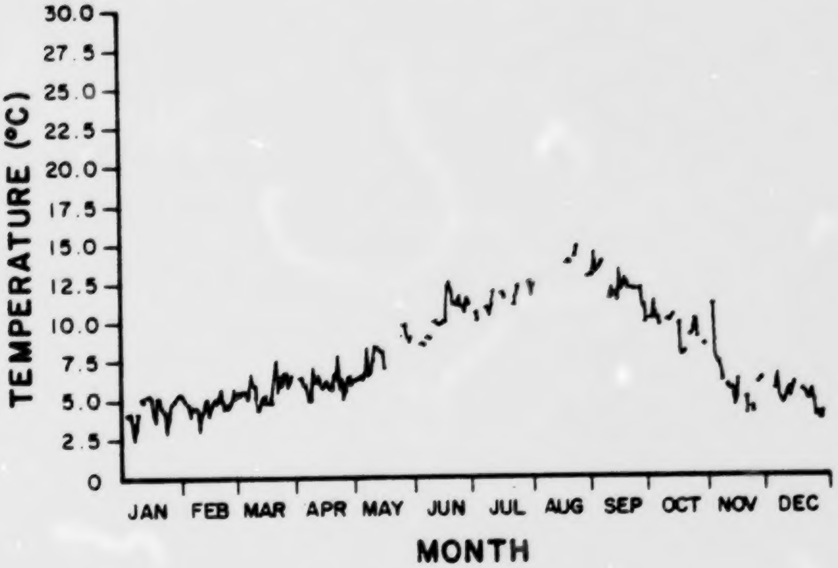


Chilliwack River 1980

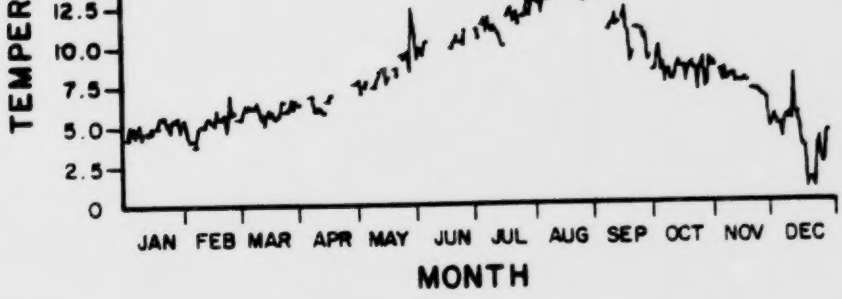


Chilliwack River 1981

Chilliwack River 1982



Chilliwack River 1983



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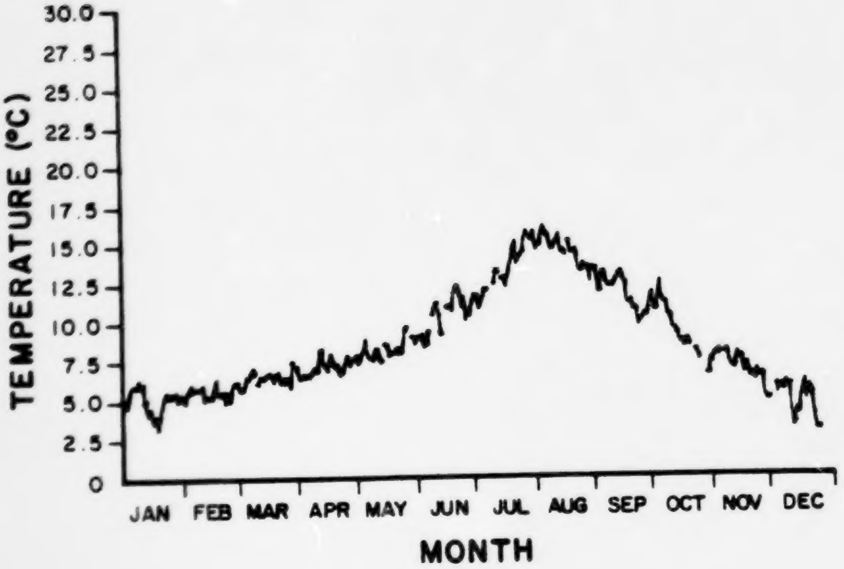

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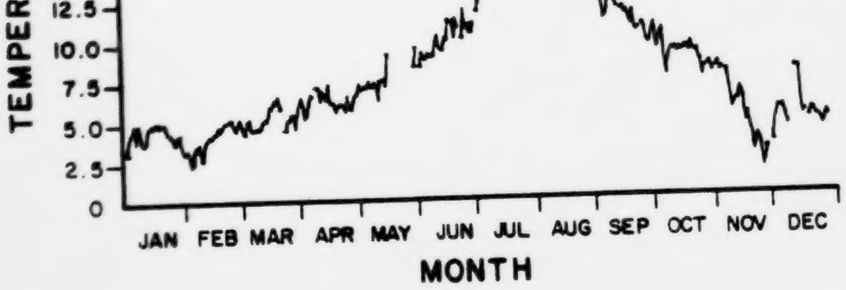
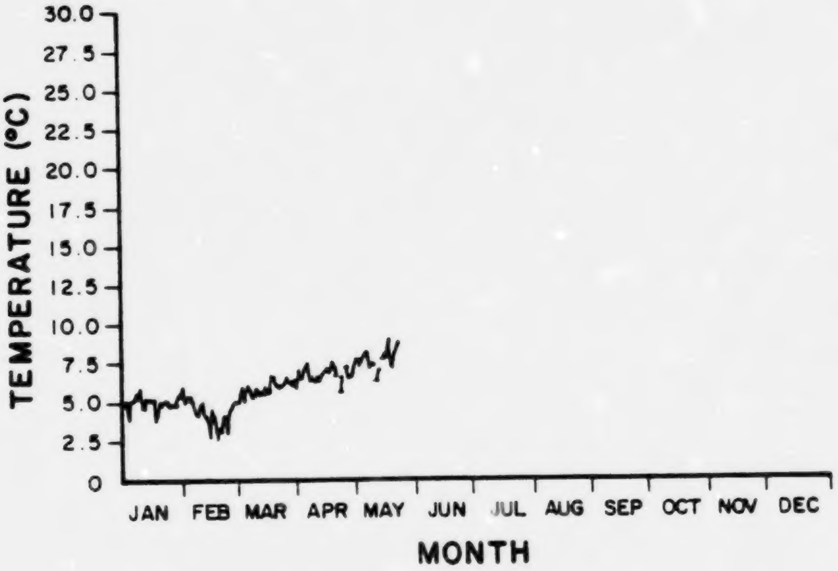


Chilliwack River 1986



Facility: CLEARWATER

Location:

Located in the village of Clearwater on the Clearwater River, 2 km upstream of its confluence with the North Thompson River.

Description:

Completed in 1984, the hatchery was built as an experimental facility, to assess enhancement strategies and potential for chinook and coho in the North Thompson area. Egg production targets in 1985 were 730 K chinook and 220 K coho, obtained from Lion Creek, Raft River and Clearwater River.

Water Sources:

Surface. No surface water is currently used. Clearwater River and Dutch Lake have both been investigated for potential supply, and a supply pipe from the Clearwater River is present.

Groundwater. Two wells (TWC-1 and TWC-2) supply all the water for the hatchery. A third well (TWC-3) has been drilled and investigated for potential use.

General Water Quality:

Well waters are of good quality, except for high levels of nitrate, phosphate, and low values of dissolved oxygen, and high values for dissolved nitrogen.

The river water is moderately soft, slightly alkaline and has adequate buffering capacity. The river was found to be high at times in nitrate, phosphate and chromium.

Special Notes:

Well water temperatures remain at a stable 8 ± 0.1°C, thus no graphs or tables of the well temperatures are included. Records for temperatures from Mike's well are available in MacKinlay (1984). The Water Survey of Canada (stn. No: 08LA001) has recorded spot temperatures from the Clearwater River.

Additional water quality records for the Clearwater River, and pump test results for wells 1 and 2 are available in MacKinlay (1984).

WATER QUALITY VALUES FOR CLEARWATER

(below detection limits = 0)

PARAMETERS	NOV17/81 CLEARWATER RIVER	OCT27/84 WELL TW-C1	FEB28/85 TW-C1 10:20 HR	MAR11/88 WELL TW-C1	MAR11/88 WELL TW-C1	MAR11/88 WELL TW-C2	MAR11/88 WELL TW-C2	FEB27/85 TW-C3 2 HRS	FEB28/85 TW-C3 24 HRS	MAR01/85 TW-C3 48 HRS	MAR11/88 WELL TW-C3
Alkalinity	32.8	85	87.7	87		87.1		98.4	98.4	96.9	107
Ammonia	.0068	0	0	.005		0		0	0	0	0
CO2											
Chloride	.6	4.4	4	2.8		4		1.8	2.9	2.4	2.8
Color											
Conductivity Field		143	140					141	142	142	
Conductivity Lab	80	221	210	230		215		215	215	215	235
Dissolved O2-ppm		11.7	3.6					1.9	1.7	1.5	
Dissolved O2-%sat		103.9	31.6					16.8	9.6	13.1	
Dissolved Gas Tot		100.8	100					95.8	96.7	97.8	
Dissolved Nitrogen		101.1	118.2					116.8	118.4	120.3	
Hardness	35.1	95.5	92.4	98.5	99.2	93.4	93.7	96.1	97.7	95	101
Nitrite	0	0	0	0		0		0	0	0	0
Nitrate	.076	1.3	1.3	.837		1.21		.08	.35	.42	.191
pH-Field			8.2					8.2	8.2	8.3	
pH-Lab	7.8	8.1	8.1	8.1		7.5		8.2	8.2	8	8.2
Phosphate	0	.044	.043	.04				.048	.048	.047	
Residue-Filterable	52	136	134	143		139		137	139	141	150
Residue-Nonfilterable	0	0	0	5		5		0	0	0	0
Silica	1.59		7.7					7.4	7.4	7.3	
Sulphate	6.45	9	9	9		7		9	10	9	7
Taste											
Temperature		6.1	8.1					8.1	8.1	6.1	
Turbidity	0	0		0		0					.18
METALS											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.0048	.001	0	0	0	.004	.004	.001	.001	0	.001
Ca-Calcium	11.4	26.8	25.9	27.6	27.9	28.8	23.9	27.1	27.5	27	28.6
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	.001	.007	.001	.001	.003	0	.001	.005
Fe-Iron	.0442	0	0	0	0	0	0	.009	0	.043	0
Hg-Mercury	0	0	.00007	0		0		.00009	.00006	.00008	0
K—potassium	.431	2.3	2.33	2.16	2.22	1.81	1.83	2.34	2.37	2.43	2.9
Mg-Magnesium	1.81	6.8	6.6	7.1	7.1	6.4	6.4	6.8	6.9	6.7	7.1
Mn-Manganese	.001	0	0	0	0	0	0	.001	0	0	0
Mo-Molybdenum	0	.005	0	0	0	0	0	0	0	0	0
Na-Sodium	.97	6.4	6	6.7	6.7	5	5	6.5	6.7	6.5	8.1
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	.08	.08	.09	.09	.021	0	.08	.07	.07	.08
Pb-Lead	0	0	0	.003	.006	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	1.87	7.6	7.7	7.1	7.2	6.6	6.8	7.4	7.4	7.3	6.4
Sn-Tin	0	0	.01	.01	0	.01	6.8	0	0	.03	.02
Sr-Strontium	.0773	.162	.154	.168	.17	.167	.17	.157	.161	.152	.174
Ti-Titanium	.0143	0	0	0	0	0	0	0	0	0	0
V—Vanadium	0	.006	.006	0	0	0	0	.005	.005	.006	0
Zn-Zinc	0	0	0	.002	.006	.006	.006	0	0	0	.038

WATER QUALITY VALUES FOR CLEARWATER

(below detection limits = 0)

PARAMETERS	MAR11/88 WELL TW-C3
Alkalinity	
Ammonia	
CO2	
Chloride	
Color	
Conductivity Field	
Conductivity Lab	
Dissolved O2-ppm	
Dissolved O2-%sat	
Dissolved Gas Tot	
Dissolved Nitrogen	
Hardness	100
Nitrite	
Nitrate	
pH-Field	
pH-Lab	
Phosphate	
Residue-Filterable	
Residue-Nonfilterable	
Silica	
Sulphate	
Taste	
Temperature	
Turbidity	
METALS	
Al-Aluminum	0
As-Arsenic	0
Ba-Barium	0
Ca-Calcium	28.3
Cd-Cadmium	0
Co-Cobalt	0
Cr-Chromium	0
Cu-Copper	0
Fe-Iron	0
Hg-Mercury	
K--potassium	2.5
Mg-Magnesium	7.1
Mn-Manganese	0
Mo-Molybdenum	0
Na-Sodium	7.5
Ni-Nickel	0
P--Phosphorus	.07
Pb-Lead	0
Sb-Antimony	0
Se-Selenium	0
Si-Silicon	6.4
Sn-Tin	.02
Sr-Strontium	.174
Ti-Titanium	0
V--Vanadium	0
Zn-Zinc	.002

Facility: CONUMA (TLUPANA)

Location:

Located midway between Gold River and Tahsis on the Conuma River, at the head of Tlupana Inlet on the west coast of Vancouver Island.

Description:

This Japanese-style hatchery, opened in 1978, was built to stabilize the chum net fishery and to increase chinook and coho stocks.

Egg production targets in 1985 were 360 K coho, 3 M chinook and 19 M chum. Eggs are taken from streams draining into Tlupana and Muchalat Inlets. Juveniles are released to the river of capture.

Water Sources:

Surface. Leagh Creek supplies up to 33,480 lpm of water by gravity to the hatchery.

Groundwater. There are six wells supplying water to the hatchery--two old wells (#1 and #2) and four new wells (#3-6).

General Water Quality:

The water is soft, and pH falls during spring runoff. The river water can become supersaturated easily on warm spring days, and due to air entrainment at valves. There are often evergreen needles in the water, such that in the fall the dirty surface water can plug up pipes in the incubation room. Temperatures are manipulated by mixing river and well waters.

Special Notes:

Well temperatures remain between 7.8 - 8°C year-round, thus tables and graphs for the wells are not included. Daily temperatures for Leagh Creek were available only for the fall of 1984. Monthly summaries from 1971 to 1986 are provided.

WATER QUALITY VALUES FOR CONUMA
(below detection limits = 0)

PARAMETERS	FEB28/78 CONUMA RIVER	FEB28/78 CONUMA RIVER	MAR07/79 CONUMA RIVER	MAR29/79 CONUMA RIVER	APR26/79 CONUMA RIVER	MAY23/79 CONUMA RIVER	OCT12/84 07:30 RIVER	OCT13/84 09:30 RIVER	OCT15/84 06:30 RIVER
Alkalinity	12.3	12.3	7.69	10.9	7.74	7.14	6	4.5	9
Ammonia	0	0					.016	.009	.032
CO2									
Chloride	1.22	1.22	.69	.92	.67		.7	7.5	3.9
Color									
Conductivity Field									
Conductivity Lab	34.3	33.3	19.3	27.2	20.5	16.8	16.5	38.6	38
Dissolved O2-ppm									
Dissolved O2-%sat							94.3	98.8	89.5
Dissolved Gas Tot							102.7	105.2	101
Dissolved Nitrogen							105	106.5	104.2
Hardness	15.3	15.3	8.2	11.1	8.02	6.43	10.1	12	13.9
Nitrite	0	0					0	0	0
Nitrate	.05	.05	.026	.0338	.025	.018	.02	.03	.07
pH-Field	7.2	7.2	6.6	7.2	7	7.1		6.7	6.9
pH-Lab							6.7	6.6	6.7
Phosphate	0	0	.004			.002	.005	.004	.004
Residue Filterable	23	22	16	23	16	22	19	34	27
Residue Non-Filter	0	0					0	0	0
Silica	1.5	1.5	.84	1.42	1.07	.65	1.2	.9	1.4
Sulphate	1.27	1.61	1.3	1.6	1.5	1	1	1	1
Taste									
Temperature							6.7	8	7.2
Turbidity	0	0					.2	.3	0
METALS--									
Al-Aluminum	0	0					.1	.11	.05
As-Arsenic	0	0					0	0	0
Ba-Barium	0	0					.001	.003	.002
Ca-Calcium	5.36	5.35	2.81	3.86	2.76	2.22	3.3	3.5	4.6
Cd-Cadmium	0	0					0		
Co-Cobalt	0	0					0	0	0
Cr-Chromium	0	0					0	0	0
Cu-Copper							.001	0	
Fe-Iron	0	0	.108		.022	.021	.027	.04	.012
Hg-Mercury	0	0					.00006	.00007	.00007
K--Potassium	.041	.041	.031	.027	.031	.023	.05	.08	.07
Mg-Magnesium	.47	.47	.287	.358	.275	.216	.3	.6	.5
Mn-Manganese	0	0					0	.005	0
Mo-Molybdenum	0	0					0	0	0
Na-Sodium	.78	.82	.5	.56	.48	.38	.8	.2	1.3
Ni-Nickle	0	0					0	0	0
P--Phosphorus							0	0	0
Pb-Lead							.06	0	0
Sb-Antimony	0	0					0	0	0
Se-Selenium	0	0					0	0	0
Si-Silicon	0	0					1.2	.9	1.4
Sn-Tin	0	0					.11	.04	0
Sr-Strontium	.0098	.007					.006	.008	.009
Ti-Titanium	0	0					0	0	0
V--Vanadium	0	0					0	0	0
Zn-Zinc	0	0					0	0	0

WATER QUALITY VALUES FOR CONUMA
(below detection limits = 0)

PARAMETERS	FEB28/78 LEAGH CREEK	MAR28/79 LEAGH CREEK	APR26/79 LEAGH CREEK	MAY23/79 LEAGH CREEK	JUN09/79 LEAGH CREEK	JUN04/82 LEAGH CREEK	JUN04/82 LEAGH CREEK	DEC02/82 LEAGH CREEK	JAN19/83 LEAGH CREEK	FEB23/83 LEAGH CREEK	APR20/83 LEAGH CREEK
Alkalinity	12.3	11.3	8.46	7.65	9.27	8					9
Ammonia											0
CO2											
Chloride	1.22	1.03	.75		.6	1					1.1
Color											
Conductivity Field											
Conductivity Lab	33.8	28.8	20.2	19.2	21.2	19.3					23.5
Dissolved O2-ppm											
Dissolved O2-%sat								97.93	99.42		97.41
Dissolved Gas Tot								103.79	106.82		102.94
Dissolved Nitrogen								105.38	108.83		102.94
Hardness	15.3	11.5	8.17	7.8	8.88	8.37	7.75	21.6	6.82	5.12	9.31
Nitrite							0				0
Nitrate	.05	.023			.0142	.11	0				.016
pH-Field	7.2	7.2	7.1	7.1	7.2	7.1		7.5	6.85		6.65
pH-Lab							7.1				
Phosphate							0				0
Residue Filterable		24	18	21	18	17	17				21
Residue Non-Filter							0				0
Silica		1.29	.86				.8				.9
Sulphate	1.44	1.7	1.6	1.1	1.1	3	3				1.9
Taste											
Temperature	4		0					5	4.6		5.9
Turbidity							0				
METALS--											
Al-Aluminum						.1	.1	0	.11	.06	.07
As-Arsenic							0	0	0	0	
Ba-Barium							0	.016	.002	0	
Ca-Calcium		4.04	2.87	2.77		2.7	2.7	7.1	2.1	1.6	3.1
Cd-Cadmium							0	0	0	0	0
Co-Cobalt							0	0	0	0	
Cr-Chromium							0	0	0	0	
Cu-Copper							0	0	0	0	0
Fe-Iron				.013	.016	.016	.016	.033	.023	.008	.013
Hg-Mercury								0	0	0	0
K--Potassium	.041	.014	.02	.014		.02	.02	.02	.03	.03	.03
Mg-Magnesium	.47	.338	.243	.215	.253	.7	.3	.8	.2	.2	.8
Mn-Manganese							0	.011	0	0	.001
Mo-Molybdenum							0	0	0	0	
Na-Sodium		.72	.57	.48		.8	.8	.8	.7	.7	.8
Ni-Nickle							0	0	0	0	
P--Phosphorus							0	0	0	0	
Pb-Lead							0	0	0	0	0
Sb-Antimony							0	0	0	0	
Se-Selenium							0	0	0	0	
Si-Silicon							.7	0	.6	.5	
Sn-Tin							0	0	0	0	
Sr-Strontium							.005	.011	.004	.003	
Ti-Titanium							0	0	0	0	
V--Vanadium							0	0	0	0	
Zn-Zinc							0	.03	.002	0	.002

WATER QUALITY VALUES FOR CONUMA
(below detection limits = 0)

PARAMETERS	SEP08/83 LEAGH CREEK	NOV24/83 LEAGH CREEK	NOV25/83 LEAGH CREEK	JAN25/84 LEAGH CREEK	APR16/84 LEAGH CREEK	APR17/84 LEAGH CREEK	MAR13/85 LEAGH CREEK
Alkalinity				4.5	7.5	7.5	13.8
Ammonia				0	0	0	0
CO2							
Chloride				1.1	1.3	1.3	1.9
Color							
Conductivity Field							
Conductivity Lab				15.1	24.9	24.9	40.5
Dissolved O2-ppm							
Dissolved O2-%sat	97.98		94.76	97.75	98.78		0
Dissolved Gas Tot	102.4		102.98	102.75	102.14		0
Dissolved Nitrogen	103.62		105.2	104.13	103.08		0
Hardness	13.4	10.3	10.3	6.38	10.1	9.63	16.2
Nitrite				0	0	0	0
Nitrate				.03	.02	.02	.07
pH-Field	7.84		7.2	7.12	7.66		7.42
pH-Lab				6.4		6.8	7.3
Phosphate				.003	0	0	.002
Residue Filterable				19	21	21	32
Residue Non-Filter				0	0	0	0
Silica				.7	1.1		1.2
Sulphate				1.7	2	2	4
Taste							
Temperature	10.9		5.7	4.2	4.3		3.2
Turbidity				0		0	.04
METALS—							
Al-Aluminum	.07	.17	.17	.12	.08	.08	0
As-Arsenic	0	0		0		0	0
Ba-Barium	.002	.002		0		0	.002
Ca-Calcium	4.6	3.2	3.2	1.9	3.3	3.3	5.5
Cd-Cadmium	0	0	0	0	0	0	0
Co-Cobalt	0	0		0		0	0
Cr-Chromium	0	.007		0		0	0
Cu-Copper	0	.001	.001	0	0	0	0
Fe-Iron	.009	.056	.056	.026	.008	.008	.012
Hg-Mercury							0
K—Potassium	.038	.045	.045	.02	.03	.03	.05
Mg-Magnesium	.4	.3	.3	.2	.3	.3	.5
Mn-Manganese	.001	.003	.003	.002	0	0	0
Mo-Molybdenum	0	0		0		0	0
Na-Sodium	1	.9	.9	.7	1	1	1.2
Ni-Nickle	0	0		0		0	0
P—Phosphorus	0	0		0		0	0
Pb-Lead	0	0	0	0	0	0	0
Sb-Antimony	0	0		0		0	0
Se-Selenium	0	0		0		0	0
Si-Silicon	1.3	1		.7		1.1	1.2
Sn-Tin	0	0		0		0	0
Sr-Strontium	.008	.005		.005		.006	.009
Ti-Titanium	0	0		0		0	0
V—Vanadium	0	0		0		0	0
Zn-Zinc	.002	.008	.008	.002	.013	.013	.003

WATER QUALITY VALUES FOR CONUMA
(below detection limits = 0)

PARAMETERS	FEB28/78 WELL # 1	FEB28/78 WELL # 1	FEB28/78 WELL # 1	DEC14/78 WELL # 1	JUN04/82 WELL # 1	JUN24/82 WELL # 1	DEC02/82 WELL # 1	APR20/83 WELL # 1	SEP08/83 WELL # 1	NOV24/83 WELL # 1	JAN25/84 WELL # 1
Alkalinity	26.4	26.4	26.4	26.1				24			21
Ammonia	.0093	.009	.0096	.0075				.006			0
CO2											
Chloride	3.5	3.5	3.5	1				1.8			2.2
Color											
Conductivity Field											
Conductivity Lab	78.6	78.2	79	74				60			60.8
Dissolved O2-ppm		49									
Dissolved O2-%sat	43	43				52	44.1	46.56	47.34	44.26	45.42
Dissolved Gas Tot	97	97				105.3	103.4	101.87	100	102.26	97.75
Dissolved Nitrogen	112	112				119.5	119.1	101.87	114.01	117.68	111.66
Hardness	30.1	29.6	30.5	31.5	28.6	12.7	24	24	24.3	22.5	24.5
Nitrite								0			0
Nitrate	.103	.103	.103	.122				.215			.23
pH-Field	7.2	7.2	7.2	7		7	6.79	6.4	7.35	6.6	6.35
pH-Lab								6.8			6.4
Phosphate								0			.003
Residue Filterable		51	49	55				44			45
Residue Non-Filter		0	0	0				0			0
Silica		3.23	3.23	3				3.3			3.3
Sulphate	5.76	6.08	5.43	5.3				3.1			2.8
Taste											
Temperature	7.8	7.8	7.8	7.5		8.5	7.9	8	7.95	7.8	7.9
Turbidity		0	0	0				0			0
METALS—											
Al-Aluminum		0	0	0		0	0	0	0	0	0
As-Arsenic		0	0	0	0	0	0	0	0	0	0
Ba-Barium		0	0	0	0	0	.001	.001	.001	.002	.001
Ca-Calcium		9.88	10.2	10.7	9.8	4.8	8.2	8.1	8.3	7.7	8.3
Cd-Cadmium		0	0	0	0	0	0	0	0	0	0
Co-Cobalt		0	0	0	0	0	0	0	0	0	0
Cr-Chromium		0	0	0	0	0	0	0	0	.007	0
Cu-Copper		0	0	0	0	0	0	0	0	.001	0
Fe-Iron		0	0	.027		0	0	.005	0	.012	0
Hg-Mercury		0	0	0			0	0			
K—Potassium	.185	.184	.186	.206	.17		.2	.11	.177	.176	.2
Mg-Magnesium	1.22	1.2	1.23	1.16	1	.2	.8	.8	.9	.8	.9
Mn-Manganese		0	0	0	.002	0	0	.003	.001	.003	.001
Mo-Molybdenum		0	0	0	0	0	0	0	0	0	0
Na-Sodium		2.37	2.52	2.59	1.6	0	2.2	2.2	2.1	2.1	2.1
Ni-Nickle		0	0	0	0	0	0	0	0	0	0
P—Phosphorus		0	0	0	0	0		0	0	0	0
Pb-Lead		0	0	0	0	0	0	0	0	0	0
Sb-Antimony		0	0	0	0	0	0	0	0	0	0
Se-Selenium		0	0	0	0	0	0	0	0	0	0
Si-Silicon				3.09	3.4	1.5	1.1	3.1	3.1	3.1	3.3
Sn-Tin		0	0	0	0	0	0	0	0	0	0
Sr-Strontium		0	0	.0185	.03	.005	.019	.016	.015	.015	.019
Ti-Titanium		0	0	0	0	0	0	0	0	0	0
V—Vanadium		0	0	0	0	0	0	0	0	0	0
Zn-Zinc		0	0	0	0	0	0	0	0	.003	.002

WATER QUALITY VALUES FOR CONUMA
(below detection limits = 0)

	APR17/84	MAR13/85	DEC14/78	JUN01/79	JUN01/79	JUN04/81	JUN04/82	JUN04/82	JUN24/82	DEC02/82	JAN19/83
	WELL	WELL	WELL	WELL	WELL	WELL	WELL	WELL	WELL	WELL	WELL
PARAMETERS	# 1	# 1	# 2	# 2	# 2	# 2	# 2	# 2	# 2	# 2	# 2
Alkalinity	22	24.5	25.6	25.2	9.27	25	25				
Ammonia	0	0	.009	.009	0		0				
CO2											
Chloride	1.8	2.2	1	1.3	.6	1.7	1.7				
Color											
Conductivity Field											
Conductivity Lab	60.9	55	61.5	62	21.2	64.9	64.9				
Dissolved O2-ppm											
Dissolved O2-%sat	49.3	0	42			49.5			49.5	51.43	46.8
Dissolved Gas Tot	101.74	0	97			99.3			99.3	101.63	100.8
Dissolved Nitrogen	115.69	0	112			112.6			112.6	114.98	114.83
Hardness	26.8	23.1	29.8	27.5	8.88	28.6	28.5	28.4	18.4	12.7	27.5
Nitrite	0	0		0	0		0				
Nitrate	.24	.24	.104	.146	.0142	.11	.11				
pH-Field	6.74	6.63	6.7			7.2			7	6.89	6.58
pH-Lab	6.3		7.2	7.6	7.2		7.2				
Phosphate	0	.004	0	0	0		0				
Residue Filterable	40	44	45	44	18	47	47				
Residue Non-Filter	0	0	0	0	0		0				
Silica	3.9	3.3	2.95	3.02	2.05		3.4				
Sulphate	2.6	4	2.3	2.2	1.1	3.2	3.2				
Taste											
Temperature	7.8	7.7	7.5	7.8		8			8	8.1	8.2
Turbidity	0	.5	0		0		0				
METALS—											
Al-Aluminum	.05	0	0	0	0				0	.07	0
As-Arsenic	0	0	0	0	0		0	0	0	0	0
Ba-Barium	0	.001	0	0	0		0	0	0	.001	.002
Ca-Calcium	8.9	7.9	10.2	9.56	3.14	9	9.9	9.8	6.9	4.3	9.5
Cd-Cadmium	0	0	0	0	0		0	0	0	0	0
Co-Cobalt	0	0	0	0	0		0	0	0	0	0
Cr-Chromium	0	0	0	0	0		0	0	0	0	0
Cu-Copper	0	0	0	0	0		0	.001	0	0	0
Fe-Iron	0	.023	.041	.017	.011				0	.011	0
Hg-Mercury		.00005	.00023	0	0					0	0
K—Potassium	.21	.22	.153	.24	0	.17	.17	.18		.18	.18
Mg-Magnesium	1	.8	1.08	.893	.253	.9	.9	.9	.3	.4	.9
Mn-Manganese	0	.003	0	0	0		0	0	0	0	0
Mo-Molybdenum	0	0	0	0	0		0	0	0	0	0
Na-Sodium	2.4	2.1	1.08	.92	.41	1.6	1.6	1.6	0	1	1.5
Ni-Nickle	0	0	0	0	0		0	0	0	0	0
P—Phosphorus			0	0	0		0	0	0	0	0
Pb-Lead	0	0	0	0	0		0	0	0	0	0
Sb-Antimony	0	0	0	0	0		0	0	0	0	0
Se-Selenium	0	0	0	0	0		0	0	0	0	0
Si-Silicon		3.3	3.09	3.02	.74		3.4	3.3	1.6	0	3.1
Sn-Tin	0	.02	0	0	0		0	0	0	0	0
Sr-Strontium	.018	.017	.0283	.0292	.0035		.03	.03	.017	.008	.029
Ti-Titanium	0	0	0	0	0		0	0	0	0	0
V—Vanadium	0	0	0	0	0		0	0	.01	0	0
Zn-Zinc	.013	0	0	.0019	0		0	0	0	0	0

WATER QUALITY VALUES FOR CONUMA
(below detection limits = 0)

PARAMETERS	APR20/83 WELL # 2	NOV24/83 WELL # 2	JAN25/84 WELL # 2	APR16/84 WELL # 2	APR17/84 WELL # 2	MAR13/85 WELL # 2	JUN09/79 WELL # 3	JUN24/82 WELL # 3	JAN19/83 WELL # 3	APR20/83 WELL # 3	APR16/84 WELL # 3
Alkalinity	25.5		23	22	22	24	26.8			26	22
Ammonia	0		0	0	0	0				0	0
CO2											
Chloride	1.7		1.9	1.7	1.7	1.7	1.85			1.4	1.6
Color											
Conductivity Field											
Conductivity Lab	64.8		61.8	63.2	63.2	62	61.2			63.7	61.2
Dissolved O2-ppm											
Dissolved O2-%sat	45.11	50.38	44.09	48.1		48.78	52.2	44.6	58.64	52.49	60.79
Dissolved Gas Tot	99.46	102.26	95.87	98.47		96.31	99.5	100.3	104.55	102.01	101.28
Dissolved Nitrogen	113.92	116.05	109.64	111.86		108.95	112.2	115.1	116.77	115.18	112.05
Hardness	27.8	27	26.7	28.4	28.1	24		19.8	25.2	27.9	27.6
Nitrite	0		0	0	0	0				0	0
Nitrate	.103		.11	.11	.11	.11	.229			.203	.21
pH-Field	6.83	6.9	6.79	6.88		7.07	6.9	7	6.79	6.82	7.02
pH-Lab	7.1		6.6		6.6	6.9				7.1	
Phosphate	0		.003	0	0	.003				0	0
Residue Filterable	46		46	45	45	46	48			44	39
Residue Non-Filter	0		0	0	0	0				0	0
Silica	3.3		3.3	3.7		3.4				3.3	3.6
Sulphate	3.7		3.5	3.2	3.2	4	2.4			2.7	2.5
Taste											
Temperature	7.9	8.3	7.9	7.8		7.4	8	8.1	7.9	7.8	7.5
Turbidity	0		0		0	.5				0	
METALS—											
Al-Aluminum	0	0	0	0	0	0		0	0	0	0
As-Arsenic	0	0	0		0	0		0	0	0	
Ba-Barium	.001	.002	.001		.001	0		0	.002	0	
Ca-Calcium	9.5	9.4	9.3	9.7	9.7	8.4		7.3	8.7	9.8	9.5
Cd-Cadmium	0	0	0	0	0	0		0	0	0	0
Co-Cobalt	0	0	0		0	0		0	0	0	
Cr-Chromium	0	.007	0		0	0		0	0	0	
Cu-Copper	0	0	0	0	0	.007		0	0	0	0
Fe-Iron	.007	.008	0	0	0	.007		0	0	0	0
Hg-Mercury	0					0			0	0	
K—Potassium	.16	.143	.18	.2	.2	.2	.186		.18	.13	.18
Mg-Magnesium	.9	.8	.9	1	1	.8		.4	.8	.9	.9
Mn-Manganese	.004	.003	.001	0	0	0		0	0	0	0
Mo-Molybdenum	0	0	0		0	0		0	0	0	
Na-Sodium	1.7	1.3	1.5	1.7	1.7	1.4		0	1.6	1.6	1.6
Ni-Nickle	0	0	0		0	0		0	0	0	
P—Phosphorus	0	0	0		0	0		0	0	0	
Pb-Lead	0	0	0	0	0	0		0	0	0	0
Sb-Antimony	0	0	0		0	0		0	0	0	
Se-Selenium	0	0	0		0	0		0	0	0	
Si-Silicon	3.2	3.2	3.3		3.7	3.4		1.8	3	3.2	
Sn-Tin	0	0	0		0	0		0	0	0	
Sr-Strontium	.028	.028	.031		.028	.026		.01	.019	.021	
Ti-Titanium	0	0	0		0	0		0	0	0	
V—Vanadium	0	0	0		0	0		0	0	0	
Zn-Zinc	.003	.003	.002	.014	.014	0	.0204	0	0	0	.012

WATER QUALITY VALUES FOR CONUMA
(below detection limits = 0)

PARAMETERS	APR17/84 WELL # 3	MAR13/85 WELL # 3	JUN13/79 WELL # 4	JUN24/82 WELL # 4	APR20/83 WELL # 4	JAN25/84 WELL # 4	APR16/84 WELL # 4	APR17/84 WELL # 4	MAR13/85 WELL # 4	APR20/83 WELL # 5	OCT14/84 10:30 HR WELL #5
Alkalinity	22	25	28.3		27.5	25	24	24	24.5	25	20.5
Ammonia	0	0	.0345		0	0	0	0	0	0	.008
CO2											
Chloride	1.6	1.8	1.3		1.2	1.4	1.6	1.6	1.4	1.7	1.5
Color											
Conductivity Field											
Conductivity Lab	61.2	60	67.5		65.3	62.4	63.9	63.9	62	62.7	57.5
Dissolved O2-ppm											
Dissolved O2-%sat		0	50.7	49.3	49.48	46.27	51.59		53.34		42.9
Dissolved Gas Tot		0	99.2	99.7	98.79	94.09	97.19		96.11		95.5
Dissolved Nitrogen		0	113.3	113.1	111.91	106.81	109.32		107.5		109.5
Hardness	27.4	26.7	32.8	19.6	27.9	27.9	28.5	28.5	27.4	25.2	23.4
Nitrite	0	0			0	0	0	0	0	0	0
Nitrate	.21	.22	.16		.105	.09	.1	.1	.1	.209	.1
pH-Field		6.91	7.2	7	6.83	6.75	7.1		7.12		7.4
pH-Lab	6.6	6.8			7.2	6.7		6.7	7	7.3	7
Phosphate	0	.003	.0045		0	.003	0	0	.003	0	0
Residue Filterable	39	47	47		51	52	42	42	47	39	38
Residue Non-Filter	0	0			0	0	0	0	0	0	0
Silica		3.4			3.3	3.4	3.6		3.3	3.3	3.1
Sulphate	2.5	3	2.5		3.4	3.3	3.2	3.2	4	2.8	3
Taste											
Temperature		7.3	7.4	8.1	8	8	7.7		7.8		7.7
Turbidity	0	.4			0	0		0	.5	0	0
METALS—											
Al-Aluminum	0	0		0	0	0	0	0	0	0	0
As-Arsenic	0	0		0	0	0		0	0	0	0
Ba-Barium	0	.001		0	.002	.001		.001	.001	0	0
Ca-Calcium	9.5	9.4		7.2	9.7	9.7	9.9	9.9	9.5	8.7	7.9
Cd-Cadmium	0	0		0	0	0	0	0	0	0	0
Co-Cobalt	0	0		0	0	0		0	0	0	0
Cr-Chromium	0	0		0	0	0		0	0	0	0
Cu-Copper	0	0		0	.001	0	0	0	0	.001	0
Fe-Iron	0	0		0	.017	.013	.006	.006	.019	.008	.011
Hg-Mercury		0	.00028		0	0			0		.0001
K—Potassium	.16	.16	.203		.14	.18	.17	.17	.18	.1	.17
Mg-Magnesium	.9	.8		.4	.9	.9	.9	.9	.8	.8	.9
Mn-Manganese	0	0		0	.003	.002	0	0	.003	.003	.002
Mo-Molybdenum	0	0		0	0	0		0	0	0	0
Na-Sodium	1.6	1.4		0	1.3	1.3	1.5	1.5	1.2	1.9	1.5
Ni-Nickle	0	0		0	0	0		0	0	0	0
P—Phosphorus	0	0		0	0	0		0	0	0	0
Pb-Lead	0	0		0	0	0	0	0	0	0	0
Sb-Antimony	0	0		0	0	0		0	0	0	0
Se-Selenium	0	0		0	0	0		0	0	0	0
Si-Silicon	3.6	3.4		1.7	3.1	3.4		3.6	3.3	3.1	3.1
Sn-Tin	0	0		0	0	0		0	0	0	.14
Sr-Strontium	.022	.022		.02	.031	.035		.031	.031	.019	.023
Ti-Titanium	0	0		0	0	0		0	0	0	0
V—Vanadium	0	0		0	0	0		0	0	0	0
Zn-Zinc	.012	0	.043	0	.003	.002	.01	.01	0	.004	0

WATER QUALITY VALUES FOR CONUMA
(below detection limits = 0)

PARAMETERS	OCT14/84 20:30 HR WELL #5	OCT15/84 08:30 HR WELL #5	MAR13/85 WELL # 5	APR20/83 WELL # 6	OCT11/84 08:30 HR WELL #6	OCT11/84 20:30 HR WELL #6	OCT12/84 08:30 HR WELL #6	OCT13/84 08:30 HR WELL #6	APR11/85 WELL # 6
Alkalinity	24	25	32.7	9	25	25.5	26	26	32.8
Ammonia	.005	0	0	0	.017	.014	.012	.013	.007
CO2									
Chloride	1.5	1.5	2.1	1.1	1.9	1.8	1.7	1.7	2.8
Color									
Conductivity Field									
Conductivity Lab	66.2	68.3	71	23.5	70.5	70.5	72.2	73.2	85
Dissolved O2-ppm									
Dissolved O2-%sat	44.6	50	72.77		46.5	46.5	46.3	46.3	
Dissolved Gas Tot	96.6	96.2	99.55		102.4	100.5	101.1	99.1	
Dissolved Nitrogen	110.4	108.5	106.69		117.2	114.9	115.6	113.1	
Hardness	26.9	28.1	36.3	8.91	34.2	32.1	31.7	30.1	41.5
Nitrite	0	0	0	0	0	0	0	0	0
Nitrate	.1	.11	.11	.016	.08	.09	.23	.09	.1
pH-Field	7.2		7.23		7.6	7.6	7.3	7.5	6.9
pH-Lab	7.1	7.1	6.9	7	7.4	7.4	7.4	7.2	6.9
Phosphate	0	0	.003	0	.08	.053	.042	.014	.007
Residue Filterable	45	47	58	21	48	50	48	49	55
Residue Non-Filter	0	0	0	0	108	74	66	20	0
Silica	3.2	3.3	3.7	.9	4.1	3.8	3.7	3.5	3.8
Sulphate	3	3	4	1.9	3	3	3	3	4
Taste									
Temperature	7.7	7.7	7.4		8	8	8	8	
Turbidity	0	0	.5	0	14.8	4.3	4.1	.8	.68
METALS—									
Al-Aluminum	0	0	0	.07	.59	.34	.27	.08	.08
As-Arsenic	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	.001	.001	.005	.003	.003	.002	.002
Ca-Calcium	9.2	9.6	12.4	3.1	10.3	10.2	10.3	10.2	14.2
Cd-Cadmium	0	0	0	0	0	0	0	.0006	0
Co-Cobalt	0	0	0	0	.007	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	.002	0	.001	.009	.007	.002	.001
Fe-Iron	.007	0	.026	.013	.502	.27	.215	.068	.041
Hg-Mercury	.00007	.00009	.00012		.00007	.00006	.00007	.00008	.00006
K—Potassium	.17	.18	.24	.03	.51	.33	.28	.38	.25
Mg-Magnesium	1	1	1.2	.3	1	1	1	1	1.3
Mn-Manganese	0	0	.002	.001	.022	.009	.009	.002	.002
Mo-Molybdenum	0	0	0	0	0	0	0	0	0
Na-Sodium	1.6	1.6	1.8	.8	1.8	1.8	1.8	1.8	2
Ni-Nickle	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	.09	.06	0	0	0
Pb-Lead	0	0	0	0	.02	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0
Si-Silicon	3.2	3.3	3.7	3.1	4.1	3.8	3.7	3.5	3.8
Sn-Tin	.19	0	0	0	.04	0	0	0	.01
Sr-Strontium	.027	.029	.037	.006	.032	.032	.033	.032	.041
Ti-Titanium	0	0	0	0	.012	.007	.006	0	0
V—Vanadium	0	0	0	0	0	0	0	0	.006
Zn-Zinc	0	0	0	.002	.004	0	.002	0	.003

LEAGH CREEK 1971

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	2.8	4.4	3.6
FEBRUARY	3.1	4.4	3.9
MARCH	3.3	5.3	4.2
APRIL	5	9.7	6.7
MAY	9.2	14.2	11.9
JUNE	10.9	15.3	13.7
JULY	13.3	21.1	17.8
AUGUST	16.1	21.7	18.7
SEPTEMBER	14.2	18.3	15.6
OCTOBER	8.9	15.6	12.8
NOVEMBER	6.7	9.4	7.8
DECEMBER	3.3	6.7	4.4

LEAGH CREEK 1972

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	3.4	3.8	3.6
FEBRUARY	3.2	3.6	3.4
MARCH	5.5	6.7	6.1
APRIL	9.2	10.5	9.9
MAY	14.3	15.3	14.9
JUNE	17.7	19	18.4
JULY	18.9	20.1	19.5
AUGUST	21	22	21.5
SEPTEMBER	18.2	18.8	18.5
OCTOBER	14.2	14.6	14.4
NOVEMBER	8.6	8.8	8.7
DECEMBER	5.7	5.9	5.8

LEAGH CREEK 1973

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	1.1	3.9	2.5
FEBRUARY	1.4	5	3.1
MARCH	3.9	7.2	5.3
APRIL	6.7	12.8	9.3
MAY	11.1	17	13.6
JUNE	13.3	18.6	15.6
JULY	15.6	21.4	18.6
AUGUST	17.8	21.7	19.5
SEPTEMBER	16.1	19.7	17.8
OCTOBER	10.6	17	13.8
NOVEMBER	4.7	10.6	7.2
DECEMBER	4.2	5.3	4.7

LEAGH CREEK 1974

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	2.5	4.2	3.6
FEBRUARY	2.5	3.9	3.3
MARCH	2.8	6.1	3.3
APRIL	5.6	10	6.7
MAY	9.7	13.9	10.5
JUNE	12.8	19.4	16.3
JULY	15.6	21.1	17.5
AUGUST	16.4	22.8	18.9
SEPTEMBER	17.2	21.7	19.2
OCTOBER	11.4	17.8	14.4
NOVEMBER	6.4	11.4	8.9
DECEMBER	3.6	7.2	5.6

LEAGH CREEK 1975

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	2.2	3.6	3.1
FEBRUARY	2.2	3.3	2.7
MARCH	2.5	10	5.2
APRIL	6.7	13.3	10.1
MAY	11.4	16.7	13.6
JUNE	13.6	18.6	16.4
JULY	16.4	22	19.2
AUGUST	16.4	21.1	18.6
SEPTEMBER	16.1	20	17.7
OCTOBER	8.6	17.8	12.4
NOVEMBER	4.4	10	7.2
DECEMBER	3.3	5.6	4.2

LEAGH CREEK 1976

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	2.8	4.4	3.6
FEBRUARY	2.8	4.2	3.7
MARCH	3.1	6.1	4.4
APRIL	4.4	12.2	7.9
MAY	10	14.4	12.6
JUNE	11.1	18.9	15.6
JULY	15.9	20.6	17.8
AUGUST	16.7	19.4	17.8
SEPTEMBER	16.7	18.3	17.6
OCTOBER	11.7	17.2	14.3
NOVEMBER	7.2	11.7	10.3
DECEMBER	5.9	8.3	7.1

LEAGH CREEK 1977

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	4.2	5.9	5
FEBRUARY	4.7	7.2	5.9
MARCH	4.4	8.9	6.2
APRIL	7.5	14.2	9.9
MAY	12.2	15.9	13.4
JUNE	13.3	20.3	17.1
JULY	17.8	22.5	19.8
AUGUST	18.9	24.2	21.8
SEPTEMBER	15.6	20.6	18.1
OCTOBER	10.9	16.4	13.6
NOVEMBER	4.2	10.3	7.1
DECEMBER	3.6	5.6	4.2

LEAGH CREEK 1978

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	3.6	3.9	3.7
FEBRUARY	4.4	4.8	4.6
MARCH	6.2	6.9	6.5
APRIL	9.4	10.1	9.8
MAY	13.4	14.7	14
JUNE	17.9	19.2	18.6
JULY	20.4	21.8	21.1
AUGUST	20.4	21.6	21
SEPTEMBER	16.7	17.1	16.9
OCTOBER	14.4	14.7	14.6
NOVEMBER	8.5	8.7	8.6
DECEMBER	5	5	5

LEAGH CREEK 1979

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	3.4	3.8	3.6
FEBRUARY	3.2	3.6	3.4
MARCH	5.5	6.7	6.1
APRIL	9.2	10.5	9.9
MAY	14.3	15.3	14.9
JUNE	17.7	19	18.4
JULY	18.9	20.1	19.5
AUGUST	21	22	21.5
SEPTEMBER	18.2	18.8	18.5
OCTOBER	14.2	14.6	14.4
NOVEMBER	8.6	8.8	8.7
DECEMBER	5.6	5.8	5.7

LEAGH CREEK 1980

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	3.5	3.8	3.7
FEBRUARY	3.5	3.8	3.7
MARCH	5.6	6.1	5.9
APRIL	9.3	9.9	9.6
MAY	14.1	15.2	14.7
JUNE	14.6	15.7	15.2
JULY	15.3	16.7	16
AUGUST	14.9	16.2	15.6
SEPTEMBER	13.8	14.6	14.2
OCTOBER	13.3	14.3	13.8
NOVEMBER	9.8	9.9	9.9
DECEMBER	6.1	6.4	6.3

LEAGH CREEK 1981

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	6	6.3	6.1
FEBRUARY	5.3	5.8	5.6
MARCH	7.3	8.3	7.8
APRIL	9.6	10.5	10.1
MAY	11.9	12.8	12.2
JUNE	14.7	15.6	15.2
JULY	17.3	18.5	17.9
AUGUST	17.1	18.1	17.6
SEPTEMBER	15.1	15.8	15.5
OCTOBER	12	12.8	12.6
NOVEMBER	9.3	9.4	9.4
DECEMBER	5.3	5.4	5.4

LEAGH CREEK 1982

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	3.9	4	4
FEBRUARY	4	4.3	4.2
MARCH	5.4	6.3	5.9
APRIL	7.8	8.8	8.3
MAY	13.3	14.1	13.7
JUNE	15.1	16.5	15.8
JULY	13.4	15.1	14.3
AUGUST	15	16.5	15.1
SEPTEMBER	15.3	16.5	15.8
OCTOBER	13.5	13.7	13.6
NOVEMBER	5.4	10.2	7.6
DECEMBER	4	6.6	5.4

LEAGH CREEK 1983

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	4.1	5.4	4.6
FEBRUARY	3.7	5.8	4.9
MARCH	5.5	8.2	6.8
APRIL	6.4	14	10.5
MAY	13.5	17.5	15
JUNE	14.4	17.6	15.7
JULY	16	18.5	17.1
AUGUST	14.7	16.7	15.9
SEPTEMBER	13.3	17.2	15.4
OCTOBER	11.9	14.3	13.4
NOVEMBER	5.9	11.6	8.8
DECEMBER	2.5	5.5	4.1

LEAGH CREEK 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	7.9	11.6	9.44	18
OCTOBER	5	11	8.14	31
NOVEMBER	4	5.6	4.85	30
DECEMBER	3	4.7	3.3	31

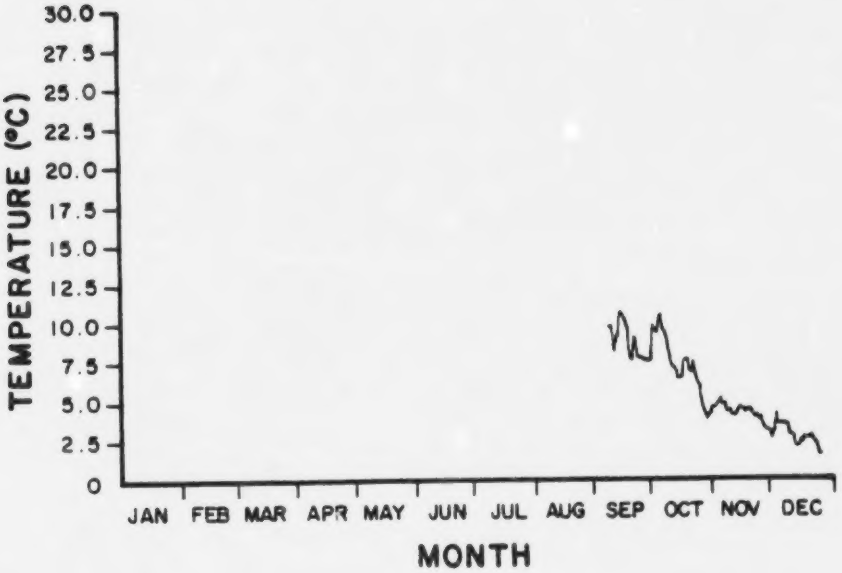
LEAGH CREEK 1985

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	3	4.8	4
FEBRUARY	3.3	5.1	4
MARCH	4.3	6.6	5.5
APRIL	6.6	10.4	9
MAY	8.3	16.3	12.6
JUNE	13.3	18	15.9
JULY	14.2	16.4	15.2
AUGUST	13.4	15	14.1
SEPTEMBER	12	15.1	13.7
OCTOBER	10	14.5	12.9
NOVEMBER	2.6	10.6	6.8
DECEMBER	2.4	4.5	3.8

LEAGH CREEK 1986

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	3.5	4.6	4
FEBRUARY	3.1	4.9	3.9
MARCH		NO DATA	
APRIL		NO DATA	
MAY		NO DATA	
JUNE		NO DATA	
JULY		NO DATA	
AUGUST		NO DATA	
SEPTEMBER		NO DATA	
OCTOBER		NO DATA	
NOVEMBER		NO DATA	
DECEMBER		NO DATA	

Leagh Creek 1984



Facility: DEVEREUX PILOT

Location:
Located on Devereux Creek, a tributary of the Klinaklini River, which flows into the top end of Knight Inlet.

Description:
This pilot hatchery was built in 1984 to investigate the potential for transfer of IHN disease from Devereux kokanee to chinook stocks, and to provide a tag group for estimation of fishery contributions. It was also intended to test the logistics of operating in remote mainland inlets.

Egg capacity is 360 K chinook.

Water Sources:

Surface. Surface water is suppied by an intake set at 10 m depth immediately below the lake outlet in Devereux Lake, and by a pump from Devereux Creek.

Groundwater. None used.

General Water Quality:
Devereux Creek and Lake are both moderately soft, high in dissolved nitrogen and low in dissolved oxygen (especially the deep lake water), but otherwise quite suitable for fish culture purposes.

Special Notice:
In 1985, water temperatures from Devereux Lake were taken from the intake, in the hypolimnion. Water temperature records for Devereux Creek and High lake in 1983 and 1984 (Jan-Feb) and water quality records for Devereux Lake in 1981 and 1983 and for High Lake in 1983 are available in MacKinlay (1984).

WATER QUALITY VALUES FOR DEVEREUX
(below detection limits = 0)

PARAMETERS	SEP08/81 DEVEREUX CREEK	OCT20/81 DEVEREUX CREEK	FEB03/83 DEVEREUX CREEK	OCT31/84 DEVEREUX CREEK	SEP24/84 DEVEREUX LAKE	OCT18/84 DEVEREUX LAKE	OCT31/84 DEVEREUX LAKE	NOV10/85 DEVEREUX LAKE
Alkalinity	16.9	19.3	20	16.7	19	17.5	16.7	19.6
Ammonia	.012	.015		.009	0	.008	.007	
CO2								
Chloride		.58		0	0	.6	0	
Color								
Conductivity Field								
Conductivity Lab	67	76.5	74.6	73	76.1	76.9	73	
Dissolved O2-ppm								
Dissolved O2-%sat					70.5	67.9		
Dissolved Gas Tot					94	97.4		
Dissolved Nitrogen					100.3	105.2		
Hardness	26.5	30	30.2	30.5	30.7	30.1	30.2	33.5
Nitrite					0	0	0	0
Nitrate	.034	.07	.08	.05	.08	.09	.05	.045
pH-Field	7.4	7.5	7.1					
pH-Lab					7.2	7.3		7.1
Phosphate	.0075	.0065	.006	.009	.003	.013	.008	
Residue Filterable	46	53	51	54	59	56	52	
Residue Non-Filter				0	0	6	0	
Silica	2.01	1.93	2.4	2.6				
Sulphate	13.6	15.6	13.7	13	14	13	13	13
Taste								
Temperature			1.5		6.1	7	6.5	
Turbidity								.53
METALS—								
Al-Aluminum	.099		.06	.17	0	.25	.16	0
As-Arsenic								0
Ba-Barium								.028
Ca-Calcium	9.46	11	10.6	10.3	10.9	10.6	10.2	11.9
Cd-Cadmium				0	0	0	0	0
Co-Cobalt								0
Cr-Chromium								0
Cu-Copper				0	0	0	0	
Fe-Iron	.166	.0543	.09	.153	.06	.24	.15	.07
Hg-Mercury					0	.008		
K—Potassium	.97	.998	1.13	1.12	1.15	1.19	1.11	1.38
Mg-Magnesium	.7	.82	.6	.8	.9	.9	.8	.9
Mn-Manganese	.0056		.006	.007	.003	.01	.007	.004
Mo-Molybdenum								0
Na-Sodium	.88	.91	1	1	1	1.1	1	1
Ni-Nickle								0
P—Phosphorus					0	0	0	0
Pb-Lead				0	0	0	0	0
Sb-Antimony								0
Se-Selenium								0
Si-Silicon					2.6	2.7	2.6	1.9
Sn-Tin								0
Sr-Strontium								.076
Ti-Titanium								0
V—Vanadium								0
Zn-Zinc	.0032	.0046		0	0	.008	0	.007

DEVEREUX CREEK 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST	16	21.5	17.69	18
SEPTEMBER	4	16.5	14.07	30
OCTOBER	8	13.5	10.3	31
NOVEMBER	2	7.8	4.99	30
DECEMBER	2	2.6	2.43	29

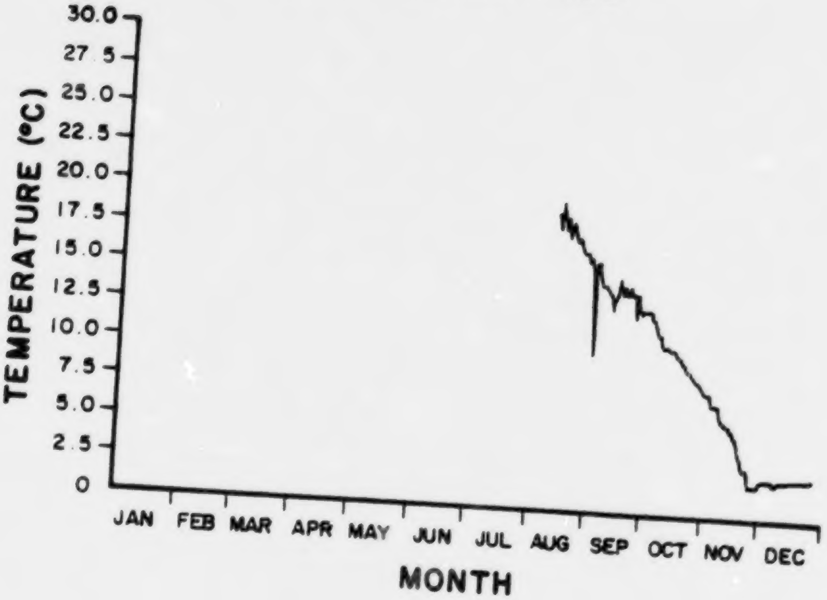
DEVEREUX CREEK 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	1.8	2.6	2.18	31
FEBRUARY	1.8	2.3	2.1	28
MARCH	1.9	3.4	2.76	31
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

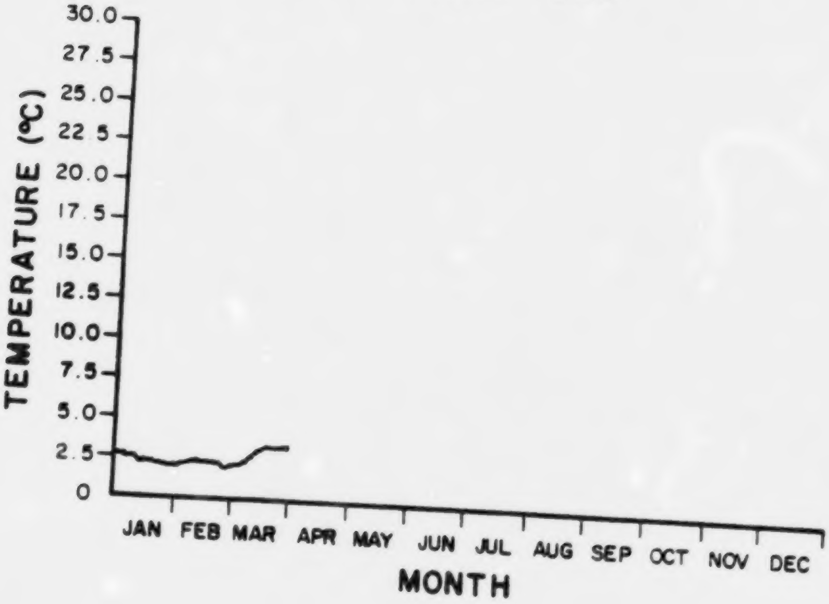
DEVEREUX LAKE 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST	3	5.5	4.51	18
SEPTEMBER	3	6	4.73	28
OCTOBER	5	7.5	6.21	31
NOVEMBER	5.7	7.3	6.77	10
DECEMBER		NO DATA		

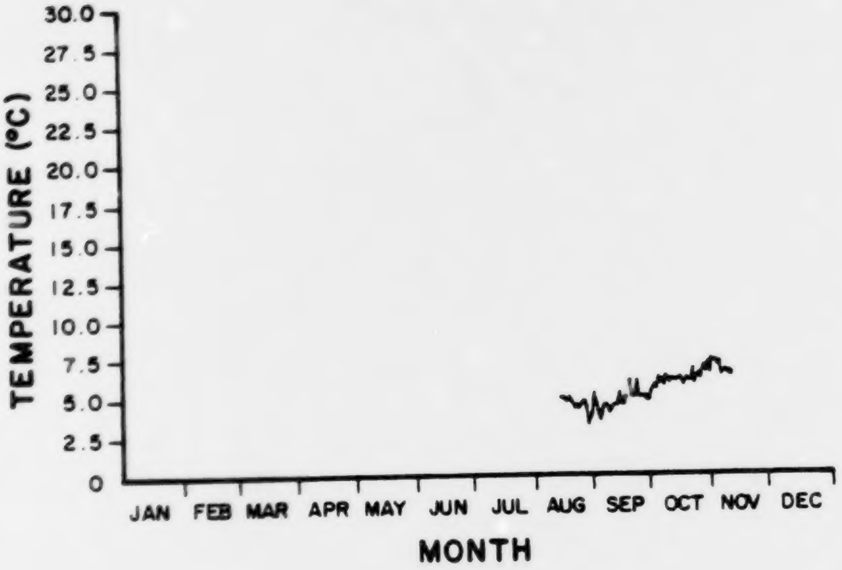
Devereux Creek 1985



Devereux Creek 1986



Devereux Lake 1985



Facility: EAGLE

Location:

Located near the Canadian Pacific Railway siding at Taft, approximately 32 km east of Sicamous on the Trans Canada Highway.

Description:

In production in 1982, the facility was built to enhance runs of chinook and coho in the Eagle and Salmon Rivers. The facility was expanded in 1984 with the addition of raceways, a new aeration tower and a new well. This ecpansion was meant to allow experimentation with various enhancement techniques for South Thompson salmon stocks.

Egg production targets for 1985 were 1 M coho and 1 M chinook. Eggs are presently taken from the Eagle and Salmon watersheds. Juveniles are released back into their systems of origin.

Water Sources:

Surface. No surface water is presently used, but both the Eagle River and Crazy Creek have been monitored for potential use.

Groundwater. Two wells (PW-E1 and PW-E2) presently supply all the water for the hatchery. The wells have been renamed Well #1 and Well #2, respectively, for this report.

General Water Quality:

Well #1 is slightly lower in pH than recommended. There is no provision for water temperature control. Well #2 supplies poor quality water, high in H_2S. Both wells are low in dissolved oxygen and high in dissolved nitrogen.

Special Notes:

Well temperatures have remained between 7.2 and 7.4 °C over the first two years of operation. Additional water temperature records for Well #1 and for Crazy Creek, and water quality records for the pump test of Well #1 and for Eagle River and Crazy Creek are available in MacKinlay (1984).

WATER QUALITY VALUES FOR EAGLE
(below detection limits = 0)

PARAMETERS	APR10/86 EAGLE RIVER	APR10/88 EAGLE RIVER	APR25/86 EAGLE RIVER	APR25/86 EAGLE RIVER	MAR07/85 WELL # 1	APR24/85 WELL # 1	APR24/85 WELL # 1	MAY15/85 WELL # 1	MAY15/85 WELL # 1	OCT30/85 WELL # 1	OCT30/85 WELL # 1
Alkalinity					38.5	36.4				35.7	
Ammonia					.007	0					
CO2											
Chloride					1.7	2.4				1.7	
Color											
Conductivity Field											
Conductivity Lab					103	103				93	
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	28.5	28.4	25.2	24.9	42.4	44.1	38.9	45.2	45.2	37.4	37.7
Nitrite					0	0				0	
Nitrate					.096	.114				.089	
pH-Field											
pH-Lab					6.9	6.7				7.1	
Phosphate					0						
Residue-Filterable					78	72				56	
Residue-Nonfilterable					0	0				0	
Silica											
Sulphate					10	9				7	
Taste											
Temperature											
Turbidity					.1	.16				0	
METALS											
Al-Aluminum	.056	.055	.115	.116	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.007	.008	.007	.006	.005	.005	.005	.005	.005	.004	.004
Ca-Calcium	8.2	8.2	7.8	7.7	13.6	14.2	12.6	14.4	14.5	11.8	11.9
Cd-Cadmium						0				0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	.017	0	0	0	0	0
Cu-Copper						.007				.001	.002
Fe-Iron	.093	.091	.069	.067	.012	.01	0	0	0	0	0
Hg-Mercury					0	.00006					
K--Potassium					0	1.61				1.48	1.57
Mg-Magnesium	1.3	1.3	1.2	1.2	2	2.1	1.8	2.2	2.1	1.9	1.9
Mn-Manganese	.004	.004	.003	.002	.004	0	0	0	0	0	0
Mo-Molybdenum	.006	.007	0	0	0	0	0	0	0	0	0
Na-Sodium	1.4	1.4	1.3	1.3	2.6	3.2	2.9	2.8	2.8	2.3	2.5
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus	0	0	0	0	0		0	0	0	0	0
Pb-Lead						0				0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	2.8	2.8	2.8	2.8	6	6.1	5.5	6.1	6.1	5.1	5.1
Sn-Tin	0	0	0	0	.01	.02	0	.01	.01	.02	.02
Sr-Strontium	.039	.042	.041	.035	.07	.078	.069	.058	.059	.067	.068
Ti-Titanium	0	0	0	0	0	0	0	0	0	.003	.003
V--Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	.004	.007	.01	0	.002	0	.006

WATER QUALITY VALUES FOR EAGLE

(below detection limits = 0)

PARAMETERS	FEB06/86 WELL # 1	FEB06/86 WELL # 1	FEB08/86 WELL # 1	FEB19/86 WELL # 1	FEB19/86 WELL # 1	FEB24/86 WELL # 1	APR25/86 WELL # 1	APR25/86 WELL # 1	MAR06/86 WELL # 1	MAR07/86 WELL # 1	NOV28/84 WELL # 2
Alkalinity											53.2
Ammonia											.01
CO2											
Chloride											2.4
Color											
Conductivity Field											
Conductivity Lab											165
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	40.1	39.9	39.9	37.8	37.6	37.8	40.6	39.1	39.7	39.7	81.9
Nitrite											0
Nitrate											.06
pH-Field											
pH-Lab											7.4
Phosphate											.018
Residue-Filterable											108
Residue-Nonfilterable											0
Silica											
Sulphate											18
Taste											
Temperature											
Turbidity											0
METALS											
Al-Aluminum	.006	.005	.005	.004	.004	.004	.002	.002	.003	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.005	.005	.005	.005	.005	.005	0	.004	.004	.004	.021
Ca-Calcium	12.9	12.8	12.8	12.1	11.9	11.9	12.7	12.4	12.6	12.6	20.2
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	.002	.002	.002	0	0	0	0	0	0	0	.006
Fe-Iron	0	0	0	0	0	0	0	0	0	0	.024
Hg-Mercury											0
K--Potassium	1.3	1.3	1.3	1.32	1.31	1.31	0	1.37	1.34	1.34	1.82
Mg-Magnesium	1.9	1.9	1.9	1.8	1.8	1.8	2.1	1.9	1.9	1.9	2.7
Mn-Manganese	0	0	0	0	0	0	0	0	0	0	.053
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	2.3	2.3	2.3	2.3	2.3	2.3	2.6	2.4	2.5	2.5	6.1
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus	0	0	0	0	0	0	0	0	0	0	.05
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	4.4	4.4	4.4	4.2	4.2	4.2	5	4.7	5.1	5.1	5.3
Sn-Tin	.01	0	0	0	.01	.01	0	0	0	0	0
Sr-Strontium	.068	.069	.069	.068	.069	.069	.081	.07	.068	.069	.132
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V--Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR EAGLE
[below detection limits = 0]

PARAMETERS	NOV28/84 WELL # 2	MAR07/85 WELL # 2	MAR18/85 WELL # 2	MAR18/85 WELL # 2	APR24/85 WELL # 2	APR24/85 WELL # 2	MAY15/85 WELL # 2	MAY15/85 WELL # 2	OCT30/85 WELL # 2	OCT30/85 WELL # 2	FEB10/86 WELL # 2
Alkalinity	53.2	56.2				54.5	55.1		59.5		
Ammonia	.01	.012				.007	0				
CO2											
Chloride	2.3	2.3				2.4	2.8		2.4		
Color											
Conductivity Field											
Conductivity Lab	165	160				148	150		148		
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	62	64.3	63.5	62.6	60.7	63.9	67.6	64.3	62.2	61	61.1
Nitrite	0	0				0	0		0	0	
Nitrate	.05	.31				.187	.094		.068		
pH-Field											
pH-Lab	7.4	7.6				7.4	7.5		7.8		
Phosphate	.018					.013	.006				
Residue-Filterable	108	108				99	96		93		
Residue-Nonfilterable	0	0				0	0		0		
Silica											
Sulphate	18	16				14	13		11		
Taste											
Temperature											
Turbidity	0	.1				.16	.1		.1		
METALS											
Al-Aluminum	0	0	0	0	0	0	.08	0	0	0	.008
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.021	.021	.022	.022	.02	.021	.02	.02	.021	.021	.02
Ca-Calcium	20.3	21.4	21	20.7	20.3	21.3	22.4	21.3	20.5	20.1	20.3
Cd-Cadmium	0		0	0		0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	.008	0	0	0	0	0
Cu-Copper	.007		0	0		.006	0	0	.001	.001	.007
Fe-Iron	.026	.054	.118	.107	.029	.031	.03	.029	.019	.02	.022
Hg-Mercury	0	0				.00005					
K--Potassium	1.83	0	1.91	1.9		2.04	1.93	1.9	2.03	1.86	1.73
Mg-Magnesium	2.7	2.8	2.8	2.6	2.4	2.5	2.7	2.8	2.6	2.8	2.5
Mn-Manganese	.053	.035	.033	.031	.021	.023	.02	.019	.017	.017	.016
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	6.1	5.4	5.4	5.3	5.3	5.6	5	4.7	4.8	4.6	4.7
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus	.09	0	0	0	0	0	.08	.07	0	0	0
Pb-Lead	0		0	0		0	0	0		B	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	5.3	5.8	5.9	5.8	5.7	6	6.2	5.9	5.3	5.3	4.4
Sn-Tin	0	0	0	0	0	0	0	0	0	.01	.01
Sr-Strontium	.133	.122	.129	.128	.116	.123	.089	.085	.118	.116	.111
Ti-Titanium	0	0	0	0	0	0	0	0	0	.003	0
V--Vanadium	0	0	0	0	0	0	0	0	0	.005	0
Zn-Zinc	0	.019	.014	.012	0	.005	.003	.002	.003	0	.005

WATER QUALITY VALUES FOR EAGLE
(below detection limits = 0)

PARAMETERS	FEB10/88 WELL # 2	FEB19/88 WELL # 2	FEB19/88 WELL # 2	MAR07/88 WELL # 2	MAR07/88 WELL # 2	MAR21/88 WELL # 2	MAR21/88 WELL # 2	APR25/88 WELL # 2	APR25/88 WELL # 2	APR25/88 WELL # 2	APR25/88 WELL # 2
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	60.1	57.5	57.6	61.1	61.4	57.3	56.9	57.5	57.5	57	57.3
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue-Filterable											
Residue-Nonfilterable											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS											
Al-Aluminum	.01	.005	.007	.005	.004	0	0	.004	.005	.005	.004
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.02	.021	.016	.02	.019	.018	.018	.018	.019	.019	.018
Ca-Calcium	19.8	19.1	19.1	20.3	20.4	18.9	18.8	18.8	19	18.9	18.9
Cd-Cadmium	0	0	0	0	0	0	0				
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	.002	0	0	.004	.001	0	0				
Fe-Iron	.022	.019	.021	.025	0	0	0	.019	0	.007	.017
Hg-Mercury											
K--Potassium	1.76	1.85	1.89	1.7	1.62	0	0				1.74
Mg-Magnesium	2.5	2.4	2.4	2.5	2.5	2.4	2.4	2.6	2.4	2.3	2.4
Mn-Manganese	.016	.015	.011	.017	.016	.015	.015	.013	.014	.014	.015
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	4.6	4.4	4.3	4.6	4.6	4.2	4.3	4.4	4.5	4.4	4.2
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	4.4	4.2	4.2	5.1	5.2	4.7	4.7	4.9	5.1	4.9	4.7
Sn-Tin	0	0	0	.02	.01	.02	.01	0	0	0	0
Sr-Strontium	.111	.114	.086	.112	.112	.107	.107	.103	.104	.104	.107
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V--Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	.004	.002	0	0	0	0	.002	0	0	0

WATER QUALITY VALUES FOR EAGLE
[below detection limits = 0]

PARAMETERS	APR25/88 WELL # 2
Alkalinity	
Ammonia	
CO2	
Chloride	
Color	
Conductivity Field	
Conductivity Lab	
Dissolved O2-ppm	
Dissolved O2-%sat	
Dissolved Gas Tot	
Dissolved Nitrogen	
Hardness	56.9
Nitrite	
Nitrate	
pH-Field	
pH-Lab	
Phosphate	
Residue-Filterable	
Residue-Nonfilterable	
Silica	
Sulphate	
Taste	
Temperature	
Turbidity	
METALS	
Al-Aluminum	.005
As-Arsenic	0
Ba-Barium	.016
Ca-Calcium	18.6
Cd-Cadmium	
Co-Cobalt	0
Cr-Chromium	0
Cu-Copper	
Fe-Iron	.019
Hg-Mercury	
K—Potassium	1.79
Mg-Magnesium	2.4
Mn-Manganese	.015
Mo-Molybdenum	0
Na-Sodium	4.3
Ni-Nickel	0
P—Phosphorus	0
Pb-Lead	0
Sb-Antimony	0
Se-Selenium	0
Si-Silicon	4.7
Sn-Tin	0
Sr-Strontium	.107
Ti-Titanium	0
V—Vanadium	0
Zn-Zinc	0

EAGLE RIVER 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	-	-	8.58	18
OCTOBER	-	-	6.53	22
NOVEMBER	-	-	4.94	27
DECEMBER	-	-	1.33	3

EAGLE RIVER 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE	-	-	9.26	5
JULY	-	-	11.67	10
AUGUST	-	-	14.03	6
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

EAGLE RIVER 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST	-	-	12.86	22
SEPTEMBER	-	-	9.72	19
OCTOBER	-	-	6.17	23
NOVEMBER	-	-	3.45	10
DECEMBER		NO DATA		

WELL 1 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	7.5	7.5	7.5	10
NOVEMBER	7.5	7.75	7.62	30
DECEMBER	7.75	8	7.95	31

WELL 1 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	8	8	8	31
FEBRUARY	8	8	8	28
MARCH	8	8	8	31
APRIL	7.5	8	7.87	17
MAY		NO DATA		
JUNE	7.5	8	7.63	14
JULY	6.75	7.5	7.05	28
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

WELL 1 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	7.4	8.1	7.82	3
OCTOBER	7.3	8	7.6	31
NOVEMBER	7.2	7.7	7.49	30
DECEMBER	6.3	7.7	7.26	30

WELL 1 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	6.7	7.8	7.45	31
FEBRUARY	7.3	8	7.68	28
MARCH	7.5	8.1	7.84	31
APRIL	7.7	8.2	7.94	30
MAY	7.6	8.4	8.01	31
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	-	-	7.84	25
OCTOBER	-	-	8	31
NOVEMBER	-	-	7.59	30
DECEMBER	-	-	7.44	31

WELL 1 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	7.2	7.7	7.48	4
FEBRUARY	7.1	7.7	7.36	28
MARCH	7.1	7.7	7.36	31
APRIL	7.2	7.8	7.46	17
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	-	-	7.91	28
OCTOBER	-	-	7.56	31
NOVEMBER	-	-	7.39	30
DECEMBER	7	7.7	7.39	31

WELL 1 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	7.2	7.7	7.48	31
FEBRUARY	7.3	7.7	7.49	17
MARCH	7.3	7.7	7.5	5
APRIL	7.2	7.8	7.53	30
MAY	7.4	8	7.64	31
JUNE	7.5	7.9	7.7	2
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

WELL 2 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER	-	-	8.82	6
DECEMBER	-	-	8.36	29

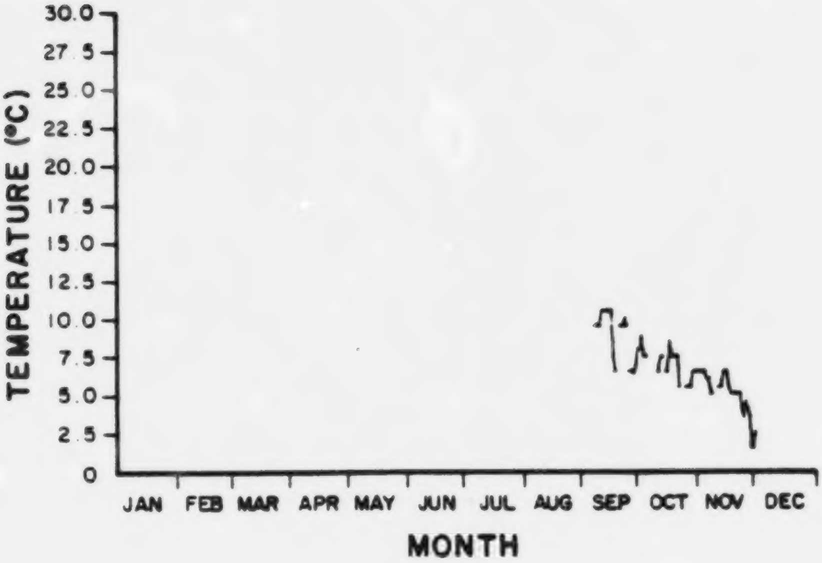
WELL 2 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	7.77	31
FEBRUARY	-	-	7.49	28
MARCH	-	-	7.52	31
APRIL	-	-	7.65	30
MAY	-	-	7.75	31
JUNE	-	-	7.87	30
JULY	-	-	8.3	31
AUGUST	-	-	8.7	31
SEPTEMBER	-	-	8.63	30
OCTOBER	-	-	8.46	31
NOVEMBER	-	-	8.17	30
DECEMBER	7.4	8.2	7.76	31

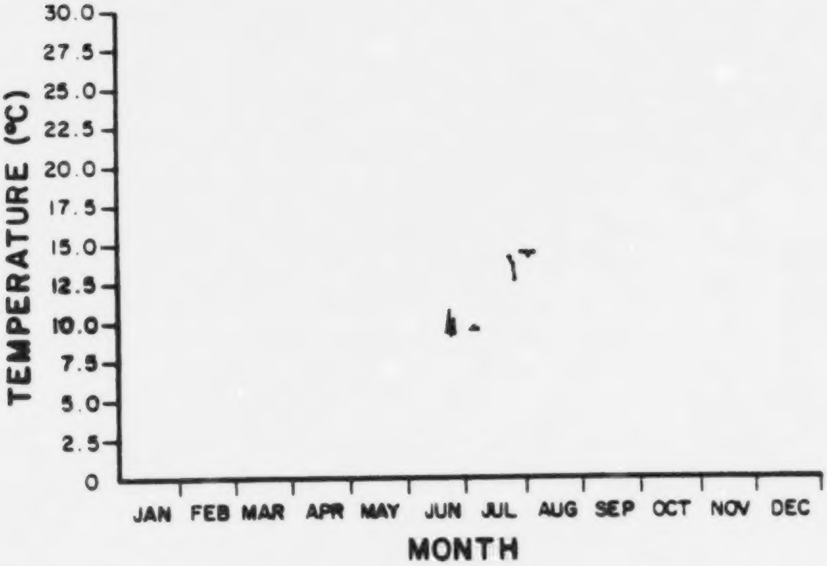
WELL 2 1986

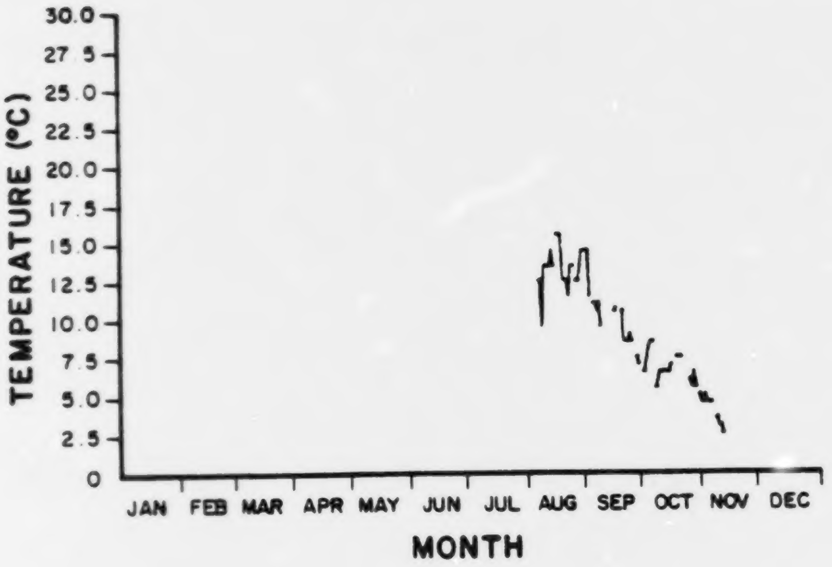
MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	7.2	8	7.6	31
FEBRUARY	7.2	7.7	7.41	28
MARCH	7.1	7.7	7.43	5
APRIL	7.2	7.8	7.52	30
MAY	7.3	8.2	7.66	31
JUNE	7.5	8.1	7.8	2
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

Eagle River 1983

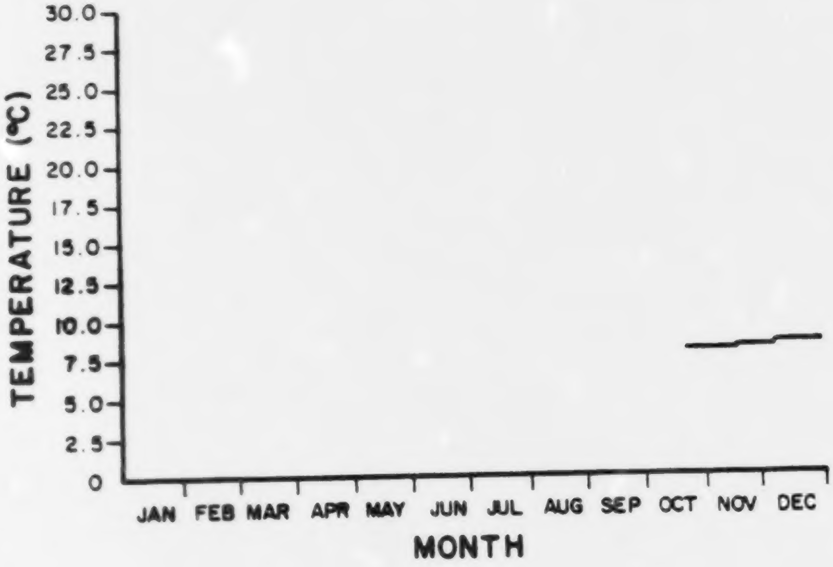


Eagle River 1984



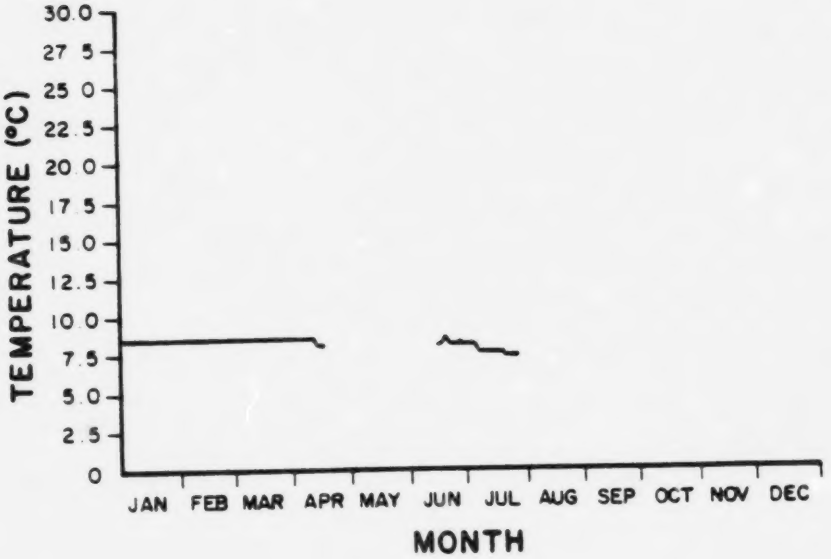


Eagle River 1985

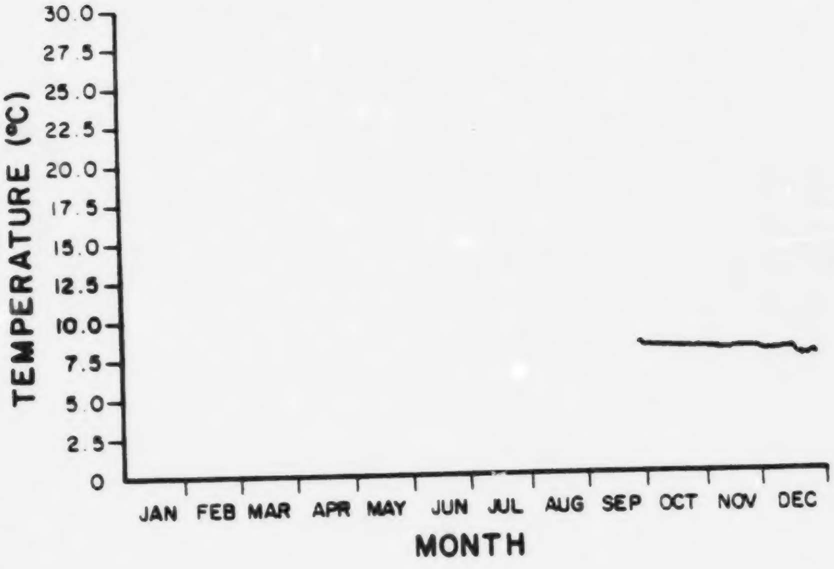


Well 1 1981

Well1 1982



Well 1 1983



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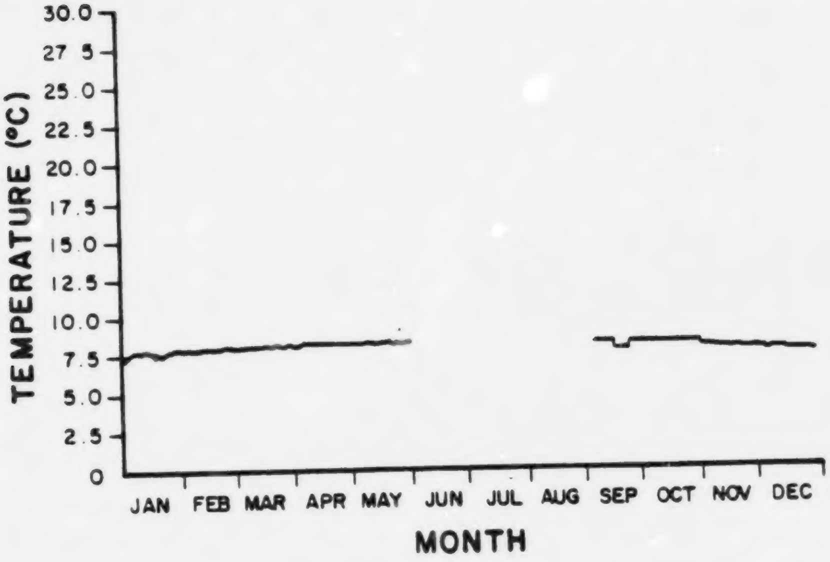
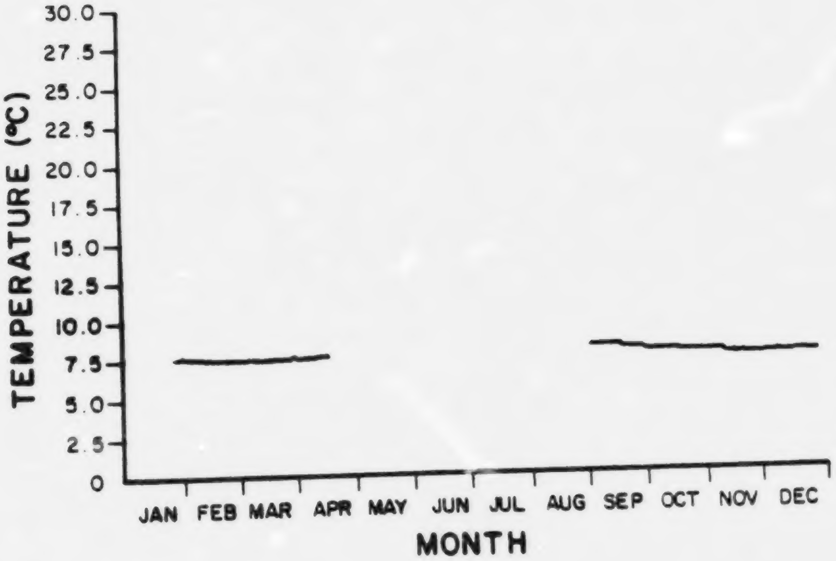


Well I 1985



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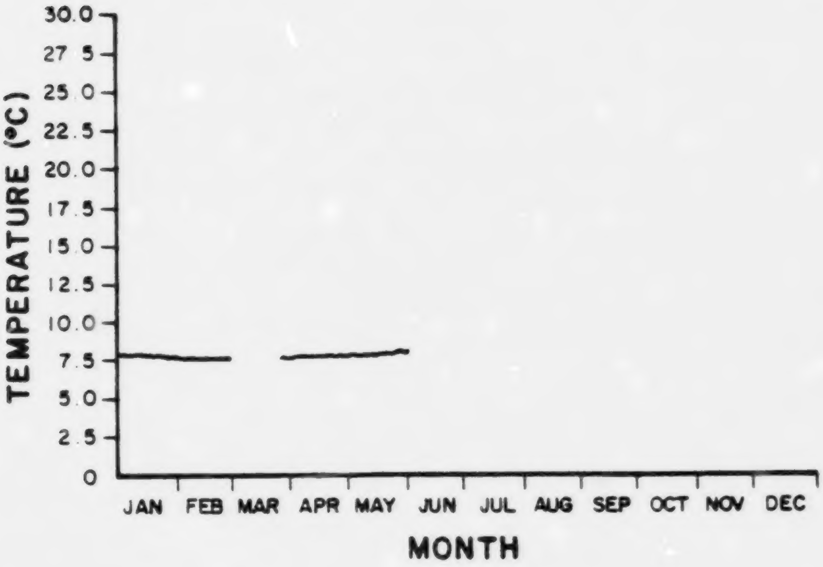

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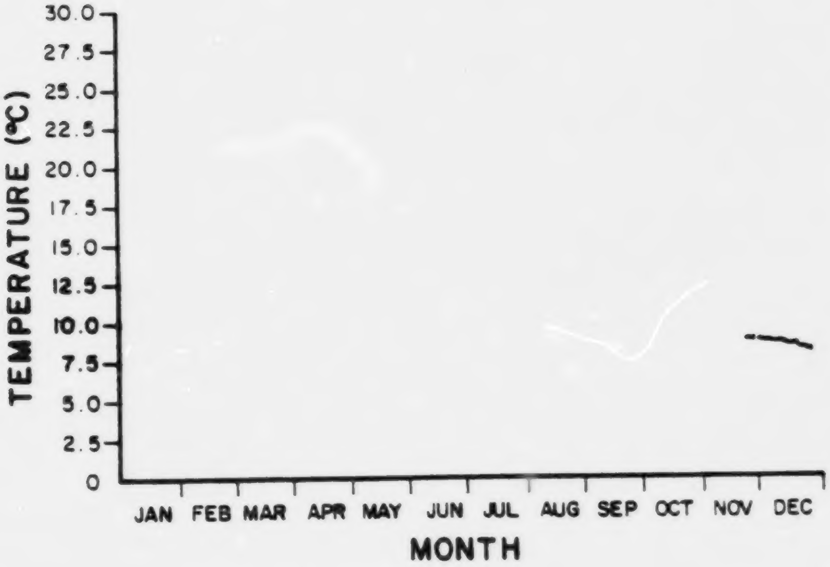

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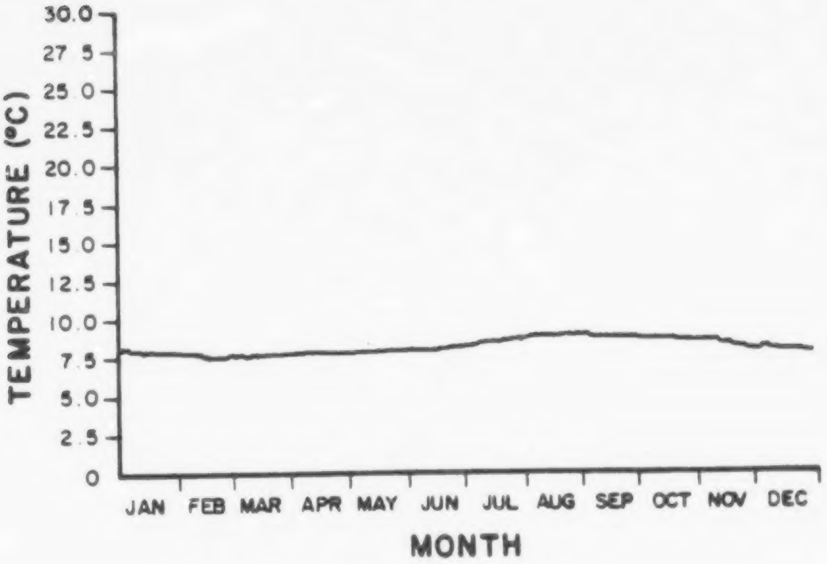

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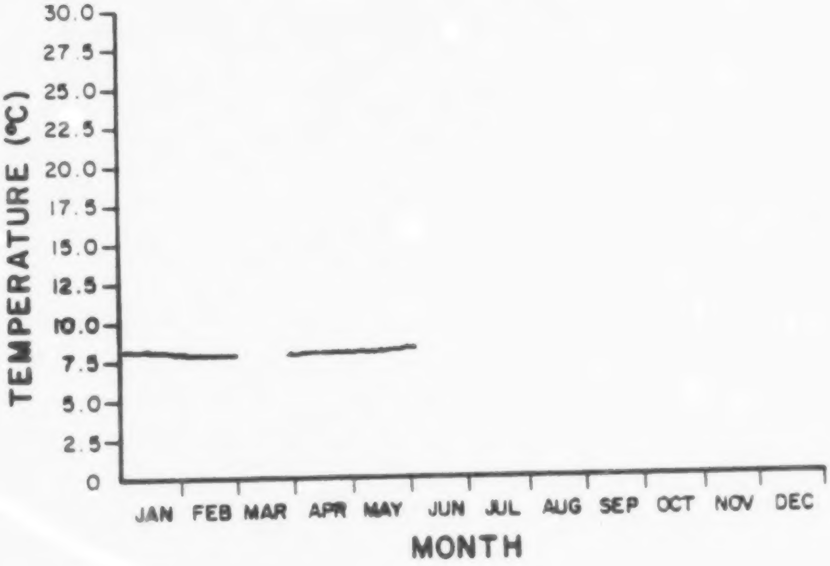


Facility: FULTON RIVER

Location:

Located on Babine Lake, 10 km from Topley Landing off Highway 35.

Description:

The first spawning channel was built in 1965 to increase the number of sockeye fry rearing in the underutilized Babine Lake. A second channel was constructed in 1971.

Egg incubating capacity is 210 M sockeye. Fulton River sockeye spawn in the channels, fry return to Fulton River. Chinook and steelhead were also reared in the channel during 1975 to 1977. However, due to the risk of receiving IHN from sockeye, this was discontinued.

Water Sources:

Surface. A concrete dam on the Fulton River, at the outlet of Fulton Lake provides water for the channels.

Groundwater. No wells have been successfully developed to date.

General Water Quality:

Water quality is satisfactory for incubation.

Special Notes:

Water quality samples for Fulton River were taken at: the counting fence, downstream of the channels; at the resevoir, above the dam; at the base of the dam; and at the Mill Pool

WATER QUALITY VALUES FOR FULTON
(below detection limits = 0)

PARAMETERS	JAN/86 SPAWNING CHANNEL1	FEB/86 SPAWNING CHANNEL1	MAR/86 SPAWNING CHANNEL1	JUL/86 SPAWNING CHANNEL1	AUG/86 SPAWNING CHANNEL1	SEP/86 SPAWNING CHANNEL1	OCT/86 SPAWNING CHANNEL1	NOV/86 SPAWNING CHANNEL1	DEC/86 SPAWNING CHANNEL1	JAN/87 SPAWNING CHANNEL1	FEB/87 SPAWNING CHANNEL1
Alkalinity								65	68	68	68
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab	13.4	12.1-	11.2-	9.5	9.8	8	5.1	11	12.3	12.9	12.2
Dissolved O2-ppm		12.6	13.6		89	77	44				
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen								51	68	51	51
Hardness											
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue-Filterable											
Residue-Nonfilterable											
Silica											
Sulphate											
Taste											
Temperature	.5	.4	1	17.8	16.1	12.2	7.2	1.8	1.8	1	.5
Turbidity											
METALS											
Al-Aluminum											
As-Arsenic											
Ba-Barium											
Ca-Calcium											
Cd-Cadmium											
Co-Cobalt											
Cr-Chromium											
Cu-Copper											
Fe-Iron											
Hg-Mercury											
K--Potassium											
Mg-Magnesium											
Mn-Manganese											
Mo-Molybdenum											
Na-Sodium											
Ni-Nickel											
P--Phosphorus											
Pb-Lead											
Sb-Antimony											
Se-Selenium											
Si-Silicon											
Sn-Tin											
Sr-Strontium											
Ti-Titanium											
V--Vanadium											

WATER QUALITY VALUES FOR FULTON
(below detection limits = 0)

PARAMETERS	MAR/67 SPAWNING CHANNEL1	AUG/67 SPAWNING CHANNEL1	DEC/71 SPAWNING CHANNEL1	FEB/72 SPAWNING CHANNEL1	NOV/72 SPAWNING CHANNEL1	NOV/73 SPAWNING CHANNEL1	MAR/74 SPAWNING CHANNEL1	NOV/74 SPAWNING CHANNEL1	AUG/75 SPAWNING CHANNEL1	MAY/80 SPAWNING CHANNEL1	NOV/71 SPAWNING CHANNEL1
Alkalinity	67		65.4-77.2	40.5	40.5	38	42	40	[illegible]		42.3
Ammonia											
CO2											6.7
Chloride				25	.01	2.5	2.5	1.5			2.5
Color											
Conductivity Field											
Conductivity Lab			91-119								
Dissolved O2-ppm	11.2	7.7		12	10.4	12	11	11	10.4	10.4	10.2
Dissolved O2 -%sat		[illegible]							102	99	
Dissolved Gas Tot										105.4	
Dissolved Nitrogen											
Hardness	51			37.5	36	21	28	21	36		27.3
Nitrite					0	0	0				0
Nitrate				24.2	22	5.9	5	6	22		17.8
pH-Field											
pH-Lab			7.5	7.16	7	7.1	7.15	7.2	7.04		7.5
Phosphate											.02
Residue-Filterable											
Residue-Nonfilterable											
Silica											5
Sulphate											4
Taste											
Temperature	.5		.5						9.2		
Turbidity											4
METALS											
Al-Aluminum											
As-Arsenic											
Ba-Barium											
Ca-Calcium											
Cd-Cadmium											
Co-Cobalt											
Cr-Chromium				.02	.02	.3	.3	0			0
Cu-Copper				.02	0	.01	.05	0			.02
Fe-Iron											.02
Hg-Mercury											
K--Potassium											
Mg-Magnesium											
Mn-Manganese											0
Mo-Molybdenum											
Na-Sodium											
Ni-Nickel											
P--Phosphorus											
Pb-Lead											
Sb-Antimony											
Se-Selenium											
Si-Silicon											
Sn-Tin											
Sr-Strontium											
Ti-Titanium											
V--Vanadium											

WATER QUALITY VALUES FOR FULTON
(below detection limits = 0)

PARAMETERS	FEB/72 CHANNEL 1	NOV24/73 CHANNEL 1	MAR02/734 CHANNEL 1	NOV24/74 CHANNEL 1	AUG/75 CH.1 0 M	AUG/75 CH.1 0.8 M	AUG/75 CH.1 13.5 M	NOV/71 CHANNEL 2	FEB/72 CHANNEL 2	NOV24/73 CHANNEL 2	MAR02/74 CHANNEL 2
Alkalinity	48	37.5	35	31	30	25	30	40.3	40.5	38	42
Ammonia											
CO2	3	2	1.8	+OR- 1	.4	.4	.4	5.2	7.4	2	1.5
Chloride	2.5	3	2.5	1.5				2.5	2.5	2.5	2.5
Color		0	0							0	0
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm	13	11.5	11.5	10.5	9.55	8.4	7.2	10.4	12	12	11
Dissolved O2 -%sat					83.82	82.35	69.23				
Dissolved Gas Tot											
Dissolved Nitrogen	.13		.2						.14		.1
Hardness	29	22.5	22	20	35	30	35	26.7	28	21	28
Nitrite	0	0	0					0	0	0	0
Nitrate	22	7	5	7				22	24.2	5.9	5
pH-Field											
pH-Lab	7.5	7.5	7.8	7.6	7	6.99	6.92	7.5	7.5	7.1	7.15
Phosphate	.02	.03	.45	.57				.02	.02	.01	.56
Residue-Filterable											
Residue-Nonfilterable											
Silica	5.1	9.75	11	7				5	5.4	9.9	11.5
Sulphate	3.5	4	11	5				3	3	4.5	12
Taste											
Temperature											
Turbidity		10	8	5				4		9	15
METALS											
Al-Aluminum											
As-Arsenic											
Ba-Barium											
Ca-Calcium											
Cd-Cadmium											
Co-Cobalt											
Cr-Chromium	0	.01	.01	.01				0	0	.03	.04
Cu-Copper	.02	.01	0	.01				.02	.02	.03	.03
Fe-Iron	.02	.01	0	0				0	.02	.01	.05
Hg-Mercury											
K—Potassium											
Mg-Magnesium											
Mn-Manganese	0	0	0	.01				0	0	0	0
Mo-Molybdenum											
Na-Sodium											
Ni-Nickel											
P—Phosphorus											
Pb-Lead											
Sb-Antimony											
Se-Selenium											
Si-Silicon											
Sn-Tin											
Sr-Strontium											
Ti-Titanium											
V—Vanadium											
Zn-Zinc											

WATER QUALITY VALUES FOR FULTON

(below detection limits = 0)

PARAMETERS	NOV24/74 CHANNEL 2	AUG/75 CHANNEL 2	NOV/71 RIVER FENCE	FEB/72 RIVER FENCE	NOV24/73 RIVER FENCE	MAR02/74 RIVER FENCE	NOV24/74 RIVER FENCE	AUG/75 RIVER FENCE	NOV/71 RESER-VOIR	FEB/72 RESER-VOIR	NOV24/73 RESER-VOIR
Alkalinity	40	25	46.3	48.5	41	40	40	20	38.3	50	39
Ammonia											
CO2	1	.4	11.3	4	4	4	1	2	4	4	2
Chloride	1.5		2.5	2.5	2.5	2	1.5		2.5	2.5	2.5
Color		6			0	0		2			0
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm	11	10.4	2.6	13	12	11.5	10	9.75	7.6	11	10.2
Dissolved O2 -%sat		102						95.6			
Dissolved Gas Tot											
Dissolved Nitrogen				.12		.15				.2	
Hardness	21	35	30.3	30	22.5	25	20	35	20.7	30	20
Nitrite			0	0	0	0			0	0	0
Nitrate	6	22	11.7	22	7	7	7		11.7	19.8	7.5
pH-Field											
pH-Lab	7.2	7.04	7.5	7.5	7.5	7.8	8.1	7.14	7.5	7.5	7.2
Phosphate	.59	.45	.02	.02	.02	.4	.67	2.6	.02	.02	.08
Residue-Filterable											
Residue-Nonfilterable											
Silica	7.45		5	5.5	12	12.75	6.5		5	3.9	10.9
Sulphate	5	4	3	3	4	11	10	2	2	2	3
Taste											
Temperature											
Turbidity	5		*4		8	11	9				6
METALS											
Al-Aluminum											
As-Arsenic											
Ba-Barium											
Ca-Calcium											
Cd-Cadmium											
Co-Cobalt									0		
Cr-Chromium	0		0	0	.01	.035	0		.02	0	.01
Cu-Copper	0		.02	.02	.02	0	.01		0	.02	.02
Fe-Iron	0		.35	.01	.01	0	0			.01	.01
Hg-Mercury											
K—Potassium											
Mg-Magnesium									0	0	0
Mn-Manganese	0	1	0	0	0	0	.01	0			
Mo-Molybdenum											
Na-Sodium											
Ni-Nickel											
P—Phosphorus											
Pb-Lead											
Sb-Antimony											
Se-Selenium											
Si-Silicon											
Sn-Tin											
Sr-Strontium											
Ti-Titanium											
V—Vanadium											
Zn-Zinc											

WATER QUALITY VALUES FOR FULTON
(below detection limits = 0)

PARAMETERS	MAR02/74 RESER-VOIR	MPV24/74 RESER-VOIR	NOV/71 DAM BASE	FEB/72 DAM BASE	NOV24/73 DAM BASE	MAR02/74 DAM BASE	NOV24/74 DAM BASE	AUG/75 MILL POOL
Alkalinity	40	35	40	45	38	40	30	20
Ammonia								
CO2	2	1	4	4	4	2	1	.4
Chloride	2.5	1.5	2.5	2.5	1.25	2.5	1.5	
Color	0				0	0		2
Conductivity Field								
Conductivity Lab								
Dissolved O2-ppm	9	9	10.6	14	12.5	10.5	11.5	10
Dissolved O2-%sat								98
Dissolved Gas Tot								
Dissolved Nitrogen	.21			.15		.25		
Hardness	21	25	28	25.5	20	23	28	35
Nitrite	0		0	0	0	0		
Nitrate	6	10	14.7	18	7	5	13	
pH-Field								
pH-Lab	7.1	7.6	7.5	7.5	7.2	7.3	7.6	7.08
Phosphate	.28	.55	.02	.02	.01	.34	.18	
Residue-Filterable								
Residue-Nonfilterable								
Silica	9	7.5	5	5.3	8.75	9	6.65	
Sulphate	5	10	2.7	3	5	9	10	3
Taste								
Temperature								
Turbidity	9	4			5	10	4	
METALS								
Al-Aluminum								
As-Arsenic								
Ba-Barium								
Ca-Calcium								
Cd-Cadmium								
Co-Cobalt								
Cr-Chromium	.01	.01	0	0	.03	.01	.01	
Cu-Copper	.01	.02	.02	.02	.03	.01	.03	
Fe-Iron	.02	.01	.03	.01	.02	0	.01	
Hg-Mercury								
K—Potassium								
Mg-Magnesium	0							1.5
Mn-Manganese		0	0	0	0	0	0	
Mo-Molybdenum								
Na-Sodium								
Ni-Nickel								
P—Phosphorus								
Pb-Lead								
Sb-Antimony								
Se-Selenium								
Si-Silicon								
Sn-Tin								
Sr-Strontium								
Ti-Titanium								
V—Vanadium								
Zn-Zinc								

FULTON RIVER 1967

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.28	-.06	-.11	25
FEBRUARY	.56	.22	.39	3
MARCH	0	.33	.2	31
APRIL	0	2.33	1.17	14
MAY	2.72	7	5.49	13
JUNE	7.94	15.11	12.41	28
JULY	14.39	18.17	16.19	27
AUGUST	16.72	19	18.05	25
SEPTEMBER	11.06	17.56	13.67	30
OCTOBER	4.89	10.11	8.31	25
NOVEMBER	1.17	5.33	3.46	29
DECEMBER	0	1.61	.3	31

FULTON RIVER 1968

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.39	.11	-.07	29
FEBRUARY	-.39	-.06	-.17	16
MARCH	.67	2.06	1.2	12
APRIL	.78	4.06	2.19	29
MAY	1.89	8.28	4.81	31
JUNE	7.5	16.61	11.22	30
JULY	13.94	19.94	16.37	31
AUGUST	14.56	19.94	16.9	31
SEPTEMBER	9.22	15.61	12.58	29
OCTOBER	5.39	9.67	7.14	30
NOVEMBER	1.61	5.78	2.79	30
DECEMBER	-.06	1.72	.7	31

FULTON RIVER 1969

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.56	.17	-.36	31
FEBRUARY	-.56	.89	.1	28
MARCH	.44	3.22	1.39	31
APRIL	1.56	4.72	3.33	29
MAY	3.56	11.28	7.26	30
JUNE	11.17	18.56	15	30
JULY	15.22	18.94	17.21	31
AUGUST	12.61	18.89	15.24	31
SEPTEMBER	10.72	13.94	12.17	28
OCTOBER	6.17	10.89	8.74	31
NOVEMBER	2.89	6.67	3.92	30
DECEMBER	1.17	3.39	2.48	25

FULTON RIVER 1970

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.56	1.61	1.06	31
FEBRUARY	1.17	2.06	1.65	28
MARCH	1.06	3.56	2.07	31
APRIL	1.78	4.28	2.98	30
MAY	3.11	11.11	5.57	31
JUNE	9.11	16.78	13.54	30
JULY	14.78	17.89	16.1	31
AUGUST	13.17	16.11	14.71	27
SEPTEMBER	9.11	14.44	11.51	30
OCTOBER	4.94	10.61	7.18	30
NOVEMBER	-.39	4.89	2.87	30
DECEMBER	-.39	.67	.26	31

FULTON RIVER 1971

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.56	.67	.12	31
FEBRUARY	-.22	1.44	.69	28
MARCH	.06	3.83	1.46	31
APRIL	1.72	5.61	3.77	30
MAY	3.28	12.06	6.26	31
JUNE	10.5	14	12.75	30
JULY	12.67	22.28	16.69	30
AUGUST	12.28	20.72	16.24	31
SEPTEMBER	9.22	14.67	11.5	30
OCTOBER	2.33	10	6.57	31
NOVEMBER	.28	3	1.83	29
DECEMBER	-.78	.61	-.33	30

FULTON RIVER 1972

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.94	.22	-.51	30
FEBRUARY	-.83	.72	.04	28
MARCH	-.67	3	1.21	31
APRIL	1.28	4.11	2.71	30
MAY	2.61	10.28	5.24	30
JUNE	9.44	14.61	12.21	30
JULY	12.67	17.44	15.02	30
AUGUST	12.83	18.06	15.79	31
SEPTEMBER	6.89	16	10.91	30
OCTOBER	4.39	7.83	6	29
NOVEMBER	.78	4.78	3.16	30
DECEMBER	-.5	1.22	.3	28

FULTON RIVER 1973

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.5	1.06	.23	30
FEBRUARY	-.44	1.06	.28	26
MARCH	.22	1.94	1.15	29
APRIL	1	4.22	2.73	29
MAY	3.06	8.61	5.49	31
JUNE	7.89	13.67	10.67	29
JULY	13	18	15.03	31
AUGUST	13.17	18	15.67	31
SEPTEMBER	8.72	14.5	11.95	29
OCTOBER	4.44	9.94	6.99	30
NOVEMBER	1.06	5.11	2.02	30
DECEMBER	.06	1.78	1.26	29

FULTON RIVER 1974

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.22	1.39	.32	29
FEBRUARY	-.06	2.17	1.42	28
MARCH	.5	3.5	1.8	30
APRIL	1.72	5.17	3.04	30
MAY	2.83	7.5	4.62	31
JUNE	6.83	15.28	11.57	30
JULY	13.39	16.61	14.62	31
AUGUST	14.5	17.39	16.14	31
SEPTEMBER	9.5	14.28	13.1	30
OCTOBER	6.5	10.5	8.32	31
NOVEMBER	2.5	6.89	4.21	30
DECEMBER	.78	2.11	1.38	31

FULTON RIVER 1975

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.06	1.72	.8	31
FEBRUARY	-.17	1.83	.77	28
MARCH	.78	3	1.66	31
APRIL	1.17	5.5	3.15	30
MAY	2.83	9.72	5.6	31
JUNE	9.83	17.33	12.95	29
JULY	14	19.28	16.44	30
AUGUST	12.44	17.44	15.45	31
SEPTEMBER	10.78	14.78	12.53	30
OCTOBER	5.22	12.06	8.35	31
NOVEMBER	0	5.78	2.59	30
DECEMBER	0	1.17	.58	31

FULTON RIVER 1976

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.5	1.33	.44	31
FEBRUARY	.22	1.33	.77	28
MARCH	.5	2.17	1.24	31
APRIL	.83	3.83	2.22	30
MAY	2.06	8.56	4.11	31
JUNE	7.56	12.78	11.15	29
JULY	11.78	14.11	13.13	31
AUGUST	12.44	16.61	14.62	31
SEPTEMBER	10.33	13.67	11.62	23
OCTOBER	4.17	11.78	7.33	30
NOVEMBER	.39	5	3.01	29
DECEMBER	-.28	.89	.48	30

FULTON RIVER 1977

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	.94	.3	30
FEBRUARY	.44	1.67	.99	28
MARCH	.39	2.94	1.53	31
APRIL	1	3.78	2.63	29
MAY	3.56	10.44	6.53	31
JUNE	9	16.22	13.07	26
JULY	14.06	18.06	15.52	27
AUGUST	14.17	21.17	16.21	31
SEPTEMBER	11.22	16.06	13.38	30
OCTOBER	5.17	12.28	8.07	31
NOVEMBER	.72	5.61	2.99	29
DECEMBER	.28	2.17	1.11	31

FULTON RIVER 1978

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.11	2	1.37	31
FEBRUARY	.61	2.67	1.97	26
MARCH	1.5	3.89	2.51	27
APRIL	2.11	5.78	3.71	30
MAY	3.28	11.06	6.36	31
JUNE	9.11	17.28	14.35	30
JULY	15.44	21.06	17.99	29
AUGUST	15	19.39	17.06	31
SEPTEMBER	10.22	17.11	13.4	30
OCTOBER	5.44	10.89	8.38	31
NOVEMBER	.94	6.28	3.02	30
DECEMBER	.06	2.17	1.29	30

FULTON RIVER 1979

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.06	.33	.19	13
FEBRUARY	.33	2.28	1.18	25
MARCH	1.22	4	2.64	31
APRIL	1.94	10.39	4.42	30
MAY	3.22	9.83	6.3	30
JUNE	8.94	15.89	12.33	30
JULY	14.17	19.28	16.41	31
AUGUST	13.67	18.78	16.25	31
SEPTEMBER	10.72	17.39	14.07	29
OCTOBER	6	12.33	9.17	31
NOVEMBER	1.78	6.61	3.74	26
DECEMBER	.5	2.28	1.15	31

FULTON RIVER 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.06	1.44	.48	31
FEBRUARY	.22	.39	.32	28
MARCH	.56	5	2.07	31
APRIL	1.94	5.89	4.05	30
MAY	3.61	12.33	7.51	31
JUNE	8.89	20.89	14.26	23
JULY	10.78	23.39	15.71	25
AUGUST	12.39	17.83	15.72	31
SEPTEMBER	10.06	14	12.01	29
OCTOBER	6.33	11.28	8.61	31
NOVEMBER	.89	6.89	4.7	30
DECEMBER	.89	2.17	1.55	31

FULTON RIVER 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	1	2.17	1.75	31
FEBRUARY	.83	2.56	1.62	28
MARCH	1.33	3.61	2.31	30
APRIL	2	4.5	3.2	29
MAY	2.94	12.28	5.4	28
JUNE	10.89	14.67	12.26	30
JULY	13.56	18.11	16	31
AUGUST	14.11	17.61	15.61	31
SEPTEMBER	9.89	15.72	13.26	29
OCTOBER	6.06	10.83	7.88	31
NOVEMBER	2.72	6.17	4.46	30
DECEMBER	-.11	3.22	1.34	31

FULTON RIVER 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.28	1.56	.43	24
FEBRUARY	.5	2.11	1.2	28
MARCH	.61	3	1.87	31
APRIL	.89	4.78	2.76	30
MAY	2	11.33	4.97	30
JUNE	9.78	19.67	14.54	30
JULY	16.06	19.67	17.74	31
AUGUST	14.22	18.56	16.17	31
SEPTEMBER	12.11	15.78	13.9	29
OCTOBER	5.11	13.5	8.8	30
NOVEMBER	1.28	5.56	3.31	27
DECEMBER	.28	2	1.28	26

FULTON RIVER 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.28	1.83	1.06	17
FEBRUARY	.78	2.44	1.64	26
MARCH	.78	4.33	2.45	13
APRIL	2.06	5.89	4.07	30
MAY	4.61	13.28	8.06	31
JUNE	10.78	15.44	13.99	30
JULY	14.22	17.72	16.13	25
AUGUST	14.28	17.67	15.95	29
SEPTEMBER	9.94	15.78	12.54	30
OCTOBER	4.78	11.33	7.12	31
NOVEMBER	.28	5.22	3.23	30
DECEMBER	.28	1.11	.8	26

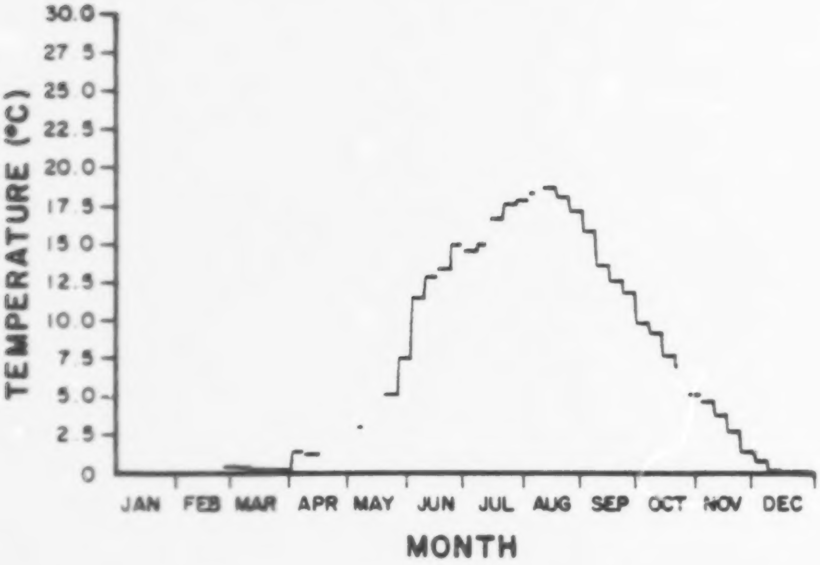
FULTON RIVER 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.67	2.67	1.66	31
FEBRUARY	1.61	3	2.29	26
MARCH	1.67	5.39	3.16	30
APRIL	3	7.11	4.81	30
MAY	4.61	10.06	7.02	31
JUNE	8.67	15.06	12.51	30
JULY	13.06	20.33	15.81	31
AUGUST	12.83	20.33	16.78	30
SEPTEMBER	9.22	15.39	11.71	30
OCTOBER	3.17	10.56	7.44	24
NOVEMBER	1.5	3.78	2.58	30
DECEMBER	0	2.06	1.44	28

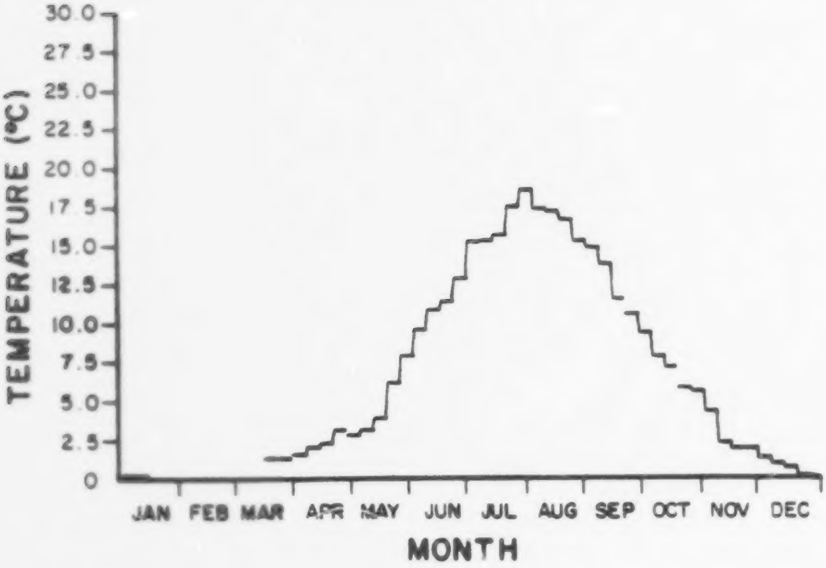
FULTON RIVER 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	1.28	2.11	1.72	20
FEBRUARY	1.28	2.89	1.91	28
MARCH	1.78	4.78	2.81	31
APRIL	2.56	6.67	4.44	23
MAY	3.94	13	7.55	31
JUNE	11.11	15.33	13.76	30
JULY	14.94	19.44	17.41	31
AUGUST	16.17	19.39	17.63	10
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

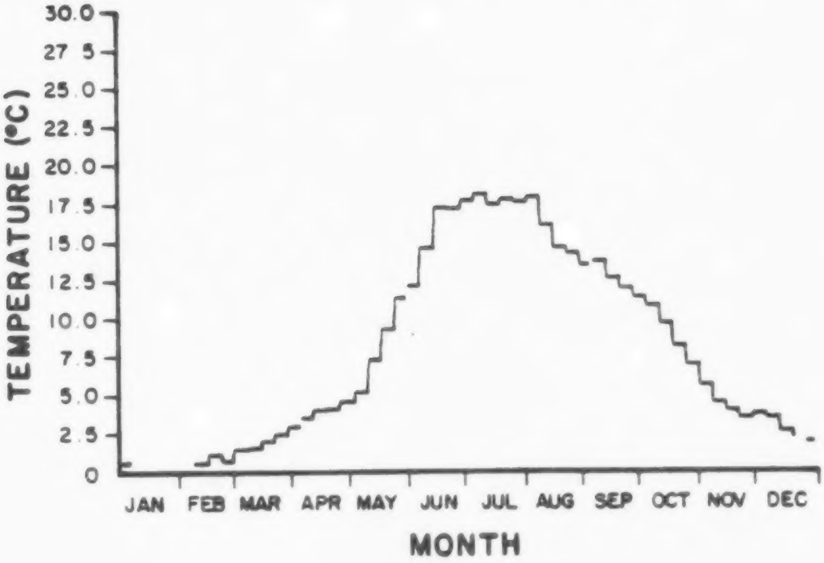
Fulton River 1967



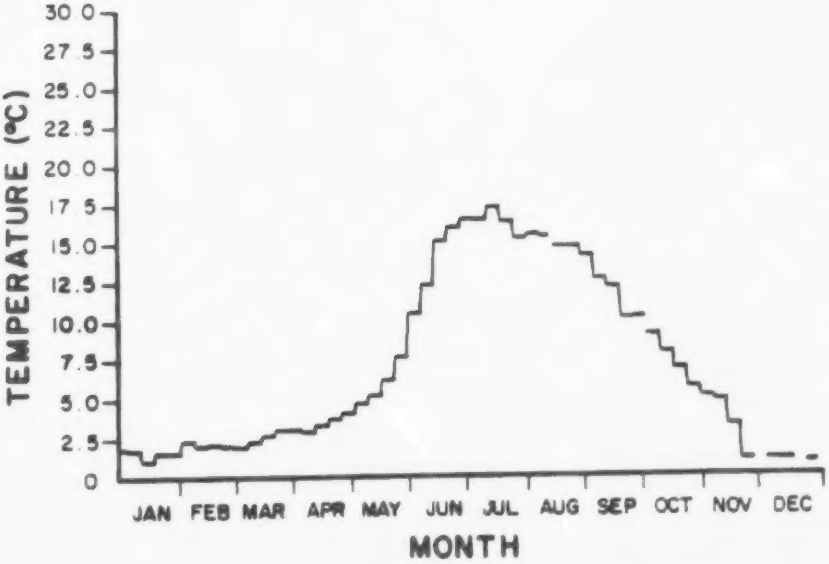
Fulton River 1968

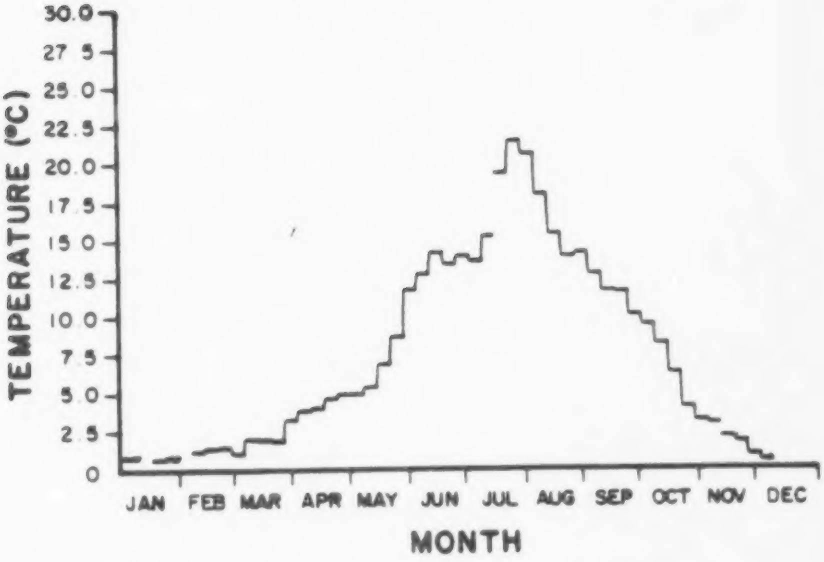


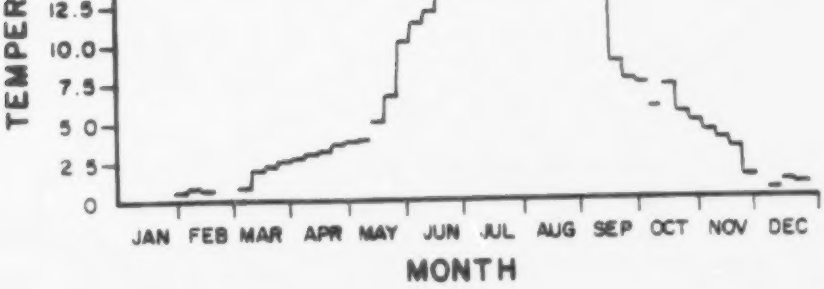
Fulton River 1969



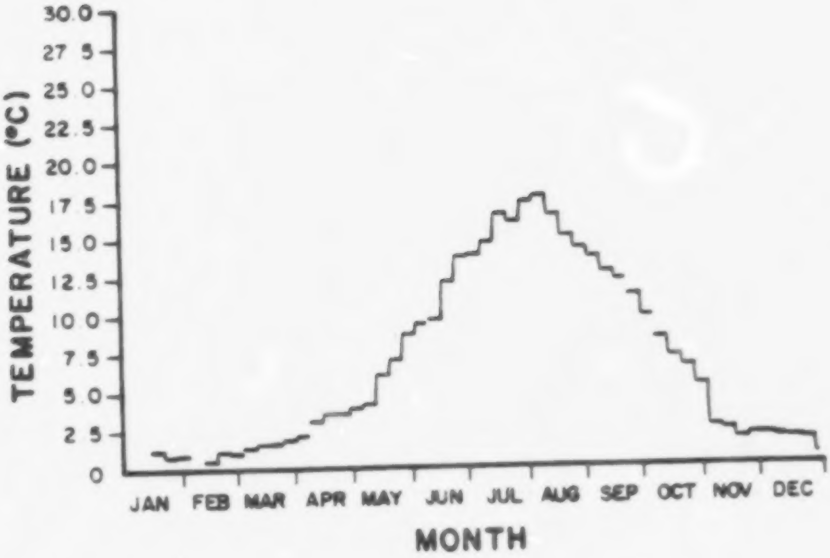
Fulton River 1970



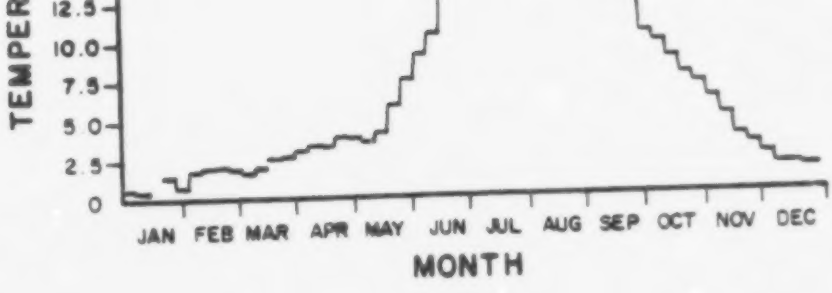

Fulton River 1971

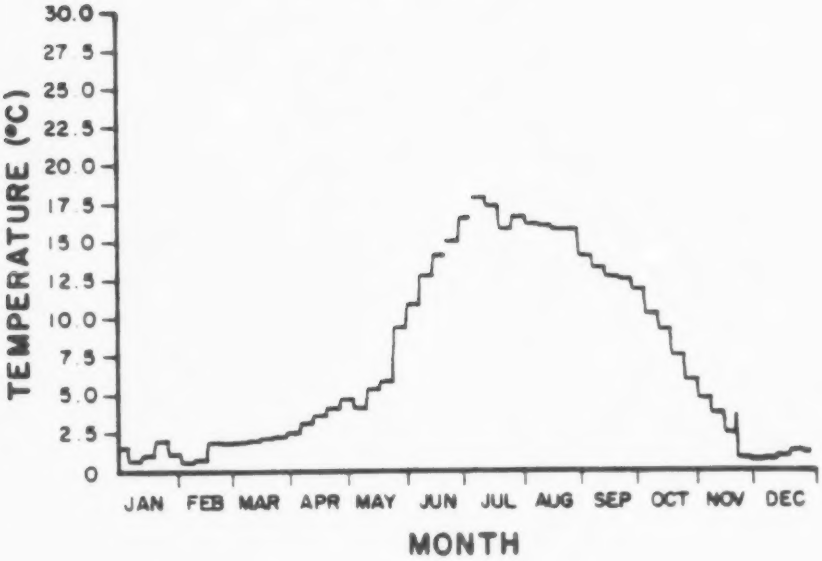

Fulton River 1972

Fulton River 1973

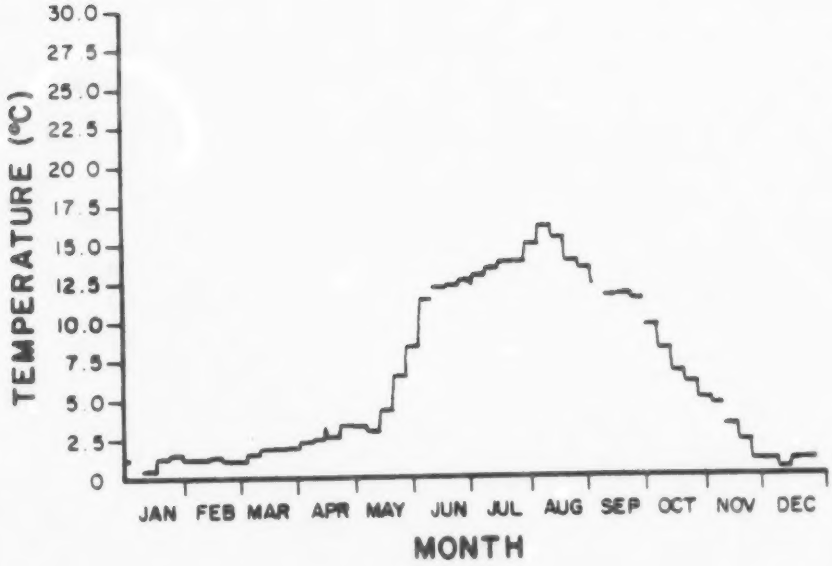


Fulton River 1974



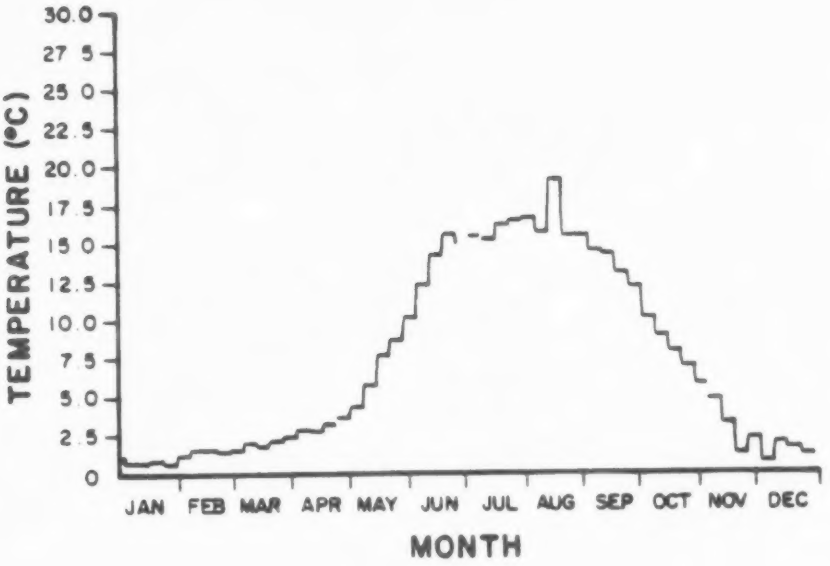


Fulton River 1975

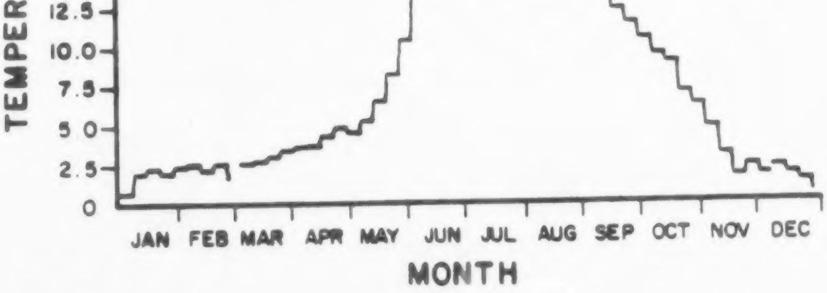


Fulton River 1976

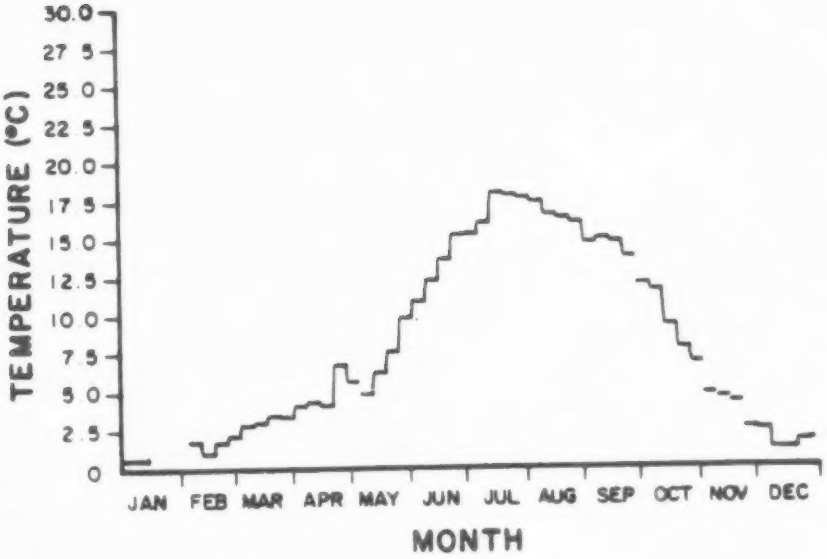
Fulton River 1977



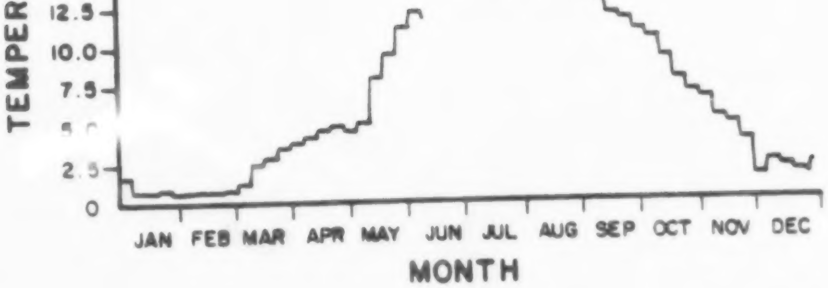
Fulton River 1978

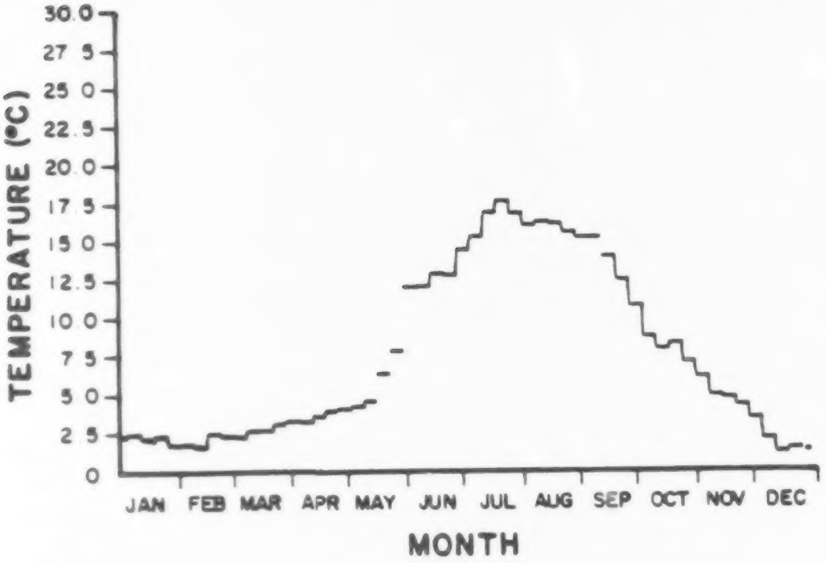


Fulton River 1979

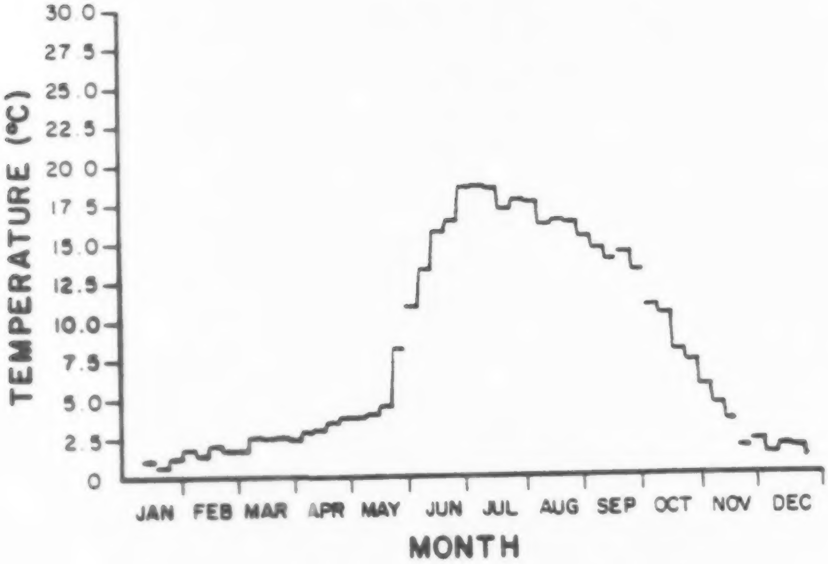


Fulton River 1980



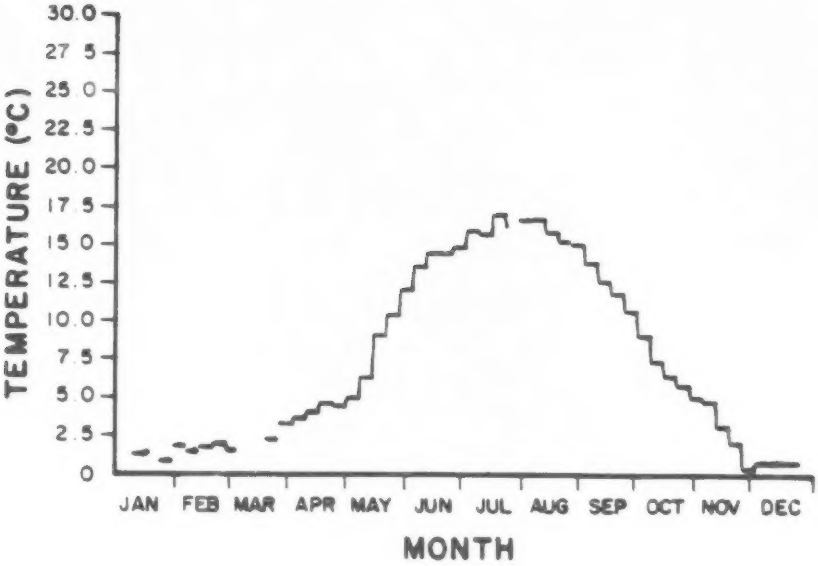


Fulton River 1981

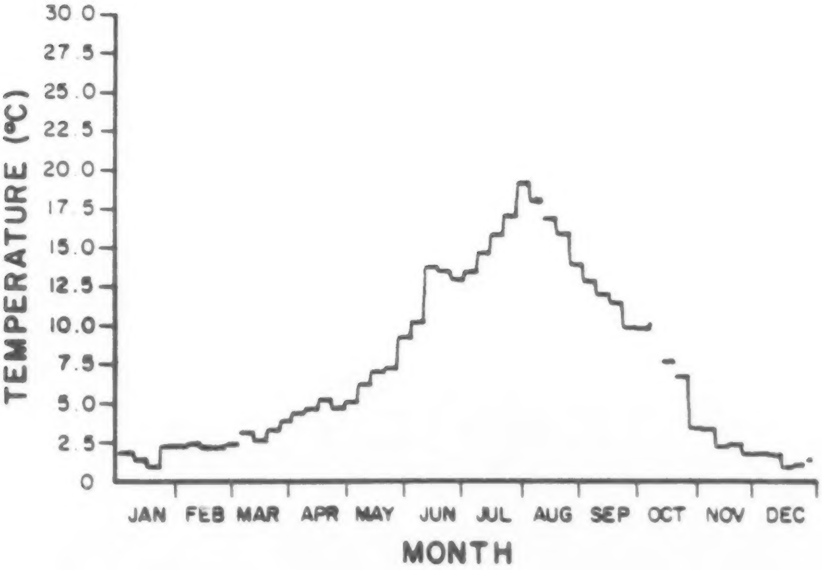


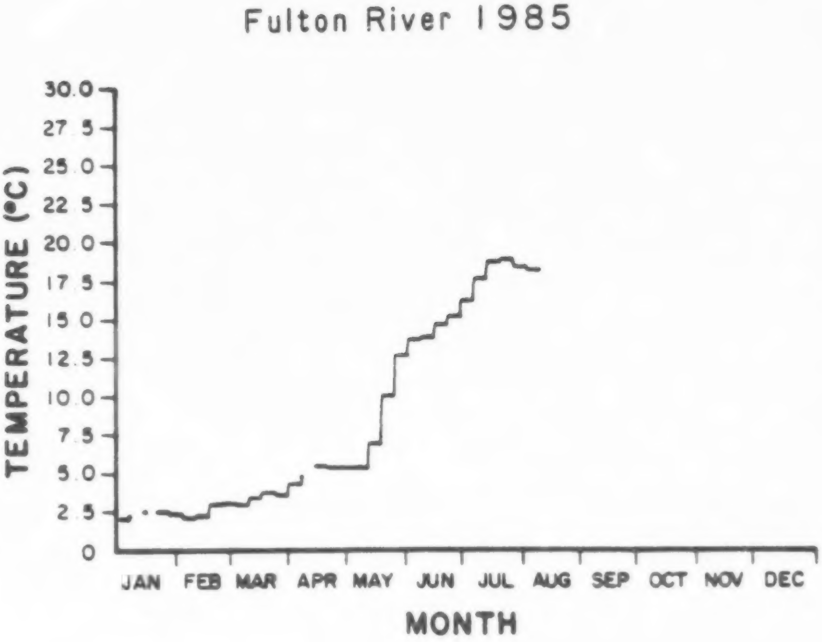
Fulton River 1982

Fulton River 1983



Fulton River 1984




Fulton River 1985
TEMPERATURE (°C)
30.0
27.5
25.0
22.5
20.0
17.5
15.0
12.5
10.0
7.5
5.0
2.5
0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
MONTH

Facility: INCH

Location:

Located 12 km east of Mission, near Dewdney, in the lower Fraser Valley.

Description:

Built due to a blockage that had occurred due to Canadian Pacific Railway bridge construction, eliminating the chum and coho runs, this pilot incubation box facility was built in 1970 on Barnes channel, between Norrish Creek and Inch Creek, and consisted of several upwelling incubation boxes a small pumphouse and an office building. Expansion to a production coho and chum hatchery, using conventional and Japanese-style technology, was completed in 1981.

Egg production targets in 1985 were 485 K coho, 75 K chinook, 8.6 M chum and 40 K cutthroat trout. Eggs are obtained from various stocks in the Stave River and Nicomen Slough area. Stocks from Birkenhead have also been incubated and reared at Inch. Juveniles are released back to areas of adult capture.

Water Sources:

Surface. There is no surface water supply at present. Norrish Creek may have potential as a future supply, but no sampling is known to have been done to date.

Groundwater. Two wells (well #1 and well #2) supply all the water for the hatchery.

General Water Quality:

The well water is lower than recommended in alkalinity, conductivity, hardness, calcium and pH. Well #2 contains higher than recommended levels of copper and lead. High nitrate levels in both wells could result in algal blooms. Water temperature can be manipulated only by mixing well water.

Special Notes:

Separate monitoring of well temperatures have not been done. Water temperatures taken within the hatchery (aerated water) may or may not be mixed, depending on whether both pumps are running. The well water temperature regime has yet to stabilize since new, larger pumps were installed in 1982.

WATER QUALITY VALUES FOR INCH CREEK
(below detection limits = 0)

PARAMETERS	DEC08/81 WELL # 1	SEP16/82 WELL # 1	FEB01/84 WELL # 1	DEC17/84 WELL # 1	DEC08/81 WELL # 2	SEP16/82 WELL # 2	FEB01/84 WELL # 2	DEC17/84 WELL # 2	JUL31/85 WELL # 2	JUL31/85 WELL # 2	AUG20/85 WELL #2
Alkalinity	8.29	8.5	5	7.4	8.77	7.5	7	8.9			
Ammonia	0	0	0	0	0	0	0	0			
CO2											
Chloride	.95	1	.6	1.4	.78	1	.7	1.5			
Color											
Conductivity Field											
Conductivity Lab	25	23.8	20.6	29	25.7	20.5	24.9	31.5			
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	7.54	9.05	7.74	9.67	8.18	7.24	8.76	10.6	8.38	8.45	
Nitrite	0	0	0	0	0	0	0	0			
Nitrate	.188	.18	.16	.19	.209	.16	.22	.25			
pH-Field											
pH-Lab	6.2	6.4	5.9	60	6.3	6.6	5.9	6.1			
Phosphate	.0074	0	0	.002	.008	0	0	.002			
Residue Filterable				28				27			
Residue Non-Filter				0				0			
Silica											
Sulphate	2.9	3.2	2.1	2	2.8	3.3	2.1	2			
Taste											
Temperature											
Turbidity		0	.1	.8		.3	0	0			
METALS—											
Al-Aluminum	0	0	.07	0	0	0	0	0	0	0	0
As-Arsenic			0	0			0	0			
Ba-Barium			.005	.006			.005	.006			
Ca-Calcium	2.48	2.8	2.4	3.1	2.85	2.3	2.9	3.5	2.8	2.8	3
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt			0	0			0	0			
Cr-Chromium			0	0			0	0			
Cu-Copper	0	0	.001	0	.0337	.028	.001	0	.002	.004	0
Fe-Iron	.0137	0	.016	0	0	.078	0	0	0	0	0
Hg-Mercury	0	0	.00012	0	0	0	0	0			
K—Potassium			.16	.21	.27	.13	.2	.19			.17
Mg-Magnesium	.34	.5	.3	.4	.38	.3	.3	.5	.35	.35	.4
Mn-Manganese	.002	0	0	0	0	0	0	0	0	0	0
Mo-Molybdenum			0	0			0	0			
Na-Sodium	1.09	2.4	.9	1.1	1.14	.9	1.1	1.2	.95	.9	1
Ni-Nickle			0	0			0	0			
P—Phosphorus			0	0			0	0			
Pb-Lead	0	0	0	0	.018	.02	0	0	.012	0	0
Sb-Antimony			0	0			0	0			
Se-Selenium			0	0			0	0			
Si-Silicon			2.6	3			3	3.4			
Sn-Tin			0	0			0	0			
Sr-Strontium			.008	.01			.011	.011			
Ti-Titanium			0	0			0	0			
V—Vanadium			0	0			0	0			
Zn-Zinc	.0016	0	0	0	.0085	.007	0	0	.003	0	0

WATER QUALITY VALUES FOR INCH CREEK
[below detection limits = 0]

PARAMETERS	AUG20/85 WELL #2	JUL31/85 MIXED WELLS	AUG20/85 MIXED WELLS	AUG20/85 MIXED WELLS	AUG20/85 MIXED WELLS	NOV15/85 MIXED WELLS	DEC17/85 MIXED WELLS
Alkalinity						10.1	
Ammonia							
CO2							
Chloride						1.2	
Color							
Conductivity Field							
Conductivity Lab						29	
Dissolved O2-ppm							
Dissolved O2-%sat							
Dissolved Gas Tot							
Dissolved Nitrogen							
Hardness		8.41	9.39	9.42	9.08	9.79	8.53
Nitrite							
Nitrate							
pH-Field							
pH-Lab						6.6	
Phosphate							
Residue Filterable						30	
Residue Non-Filter						0	
Silica							
Sulphate						3	
Taste							
Temperature							
Turbidity						.15	
METALS—							
Al-Aluminum	0	0	0	0	0	0	0
As-Arsenic		0	0	0	0	0	0
Ba-Barium		.005	.006	.006	.004	.007	.005
Ca-Calcium	3	2.8	3	3	3	3.2	2.8
Cd-Cadmium	0	0	0	0	0	0	0
Co-Cobalt		0	0	0	0	0	0
Cr-Chromium		0	0	0	0	0	0
Cu-Copper	.005		0	.001	0	0	0
Fe-Iron	0	0	0	0	0	0	0
Hg-Mercury						.00007	
K—Potassium	.21		.17	.18	.17	.26	.23
Mg-Magnesium	.4	.4	.4	.4	.4	.4	.4
Mn-Manganese	0	0	0	0	0	.003	.001
Mo-Molybdenum		0	0	0	0	0	0
Na-Sodium	1	1	1	1	1	1.2	1.1
Ni-Nickle		0	0	0	0	0	0
P—Phosphorus		0	0	0	0	0	0
Pb-Lead	0		0	0	0	0	0
Sb-Antimony		0	0	0	0	0	0
Se-Selenium		0	0	0	0	0	0
Si-Silicon		2.7	2.5	2.5	2.4	2.7	2.4
Sn-Tin		0	0	0	0	0	0
Sr-Strontium		.009	.008	.009	.008	.012	.009
Ti-Titanium		0	0	0	0	0	0
V—Vanadium		0	0	0	0	0	0
Zn-Zinc	.004	0	0	0	.003	0	0

WELL 1 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY	-	-	8.24	28
MARCH	-	-	6.54	31
APRIL	-	-	7	30
MAY	-	-	7	31
JUNE	-	-	6.83	15
JULY	-	-	7.97	30
AUGUST	-	-	9.7	29
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

WELL 1 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	9.06	21
FEBRUARY	-	-	7.2	28
MARCH	-	-	7.16	26
APRIL		NO DATA		
MAY	-	-	5.69	21
JUNE	-	-	6.38	30
JULY	7.9	-50	-9.44	31
AUGUST	-	-	9.09	20
SEPTEMBER	-	-	11.18	6
OCTOBER	-	-	12.23	31
NOVEMBER	-	-	11.91	30
DECEMBER	-	-	10.05	25

WELL 1 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	8.15	31
FEBRUARY	-	-	6.34	28
MARCH	-	-	5.92	31
APRIL	-	-	6.7	25
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	-	-	11.32	26
OCTOBER	-	-	12.65	31
NOVEMBER	-	-	11.94	30
DECEMBER	-	-	10	31

WELL 1 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	8.03	31
FEBRUARY	-	-	7	11
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

WELL 2 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER	-	-	9.98	4

WELL 2 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	9.76	31
FEBRUARY	-	-	9.9	1
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE	-	-	6.81	15
JULY	-	-	7.2	1
AUGUST	-	-	7.3	2
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER	-	-	10.1	9

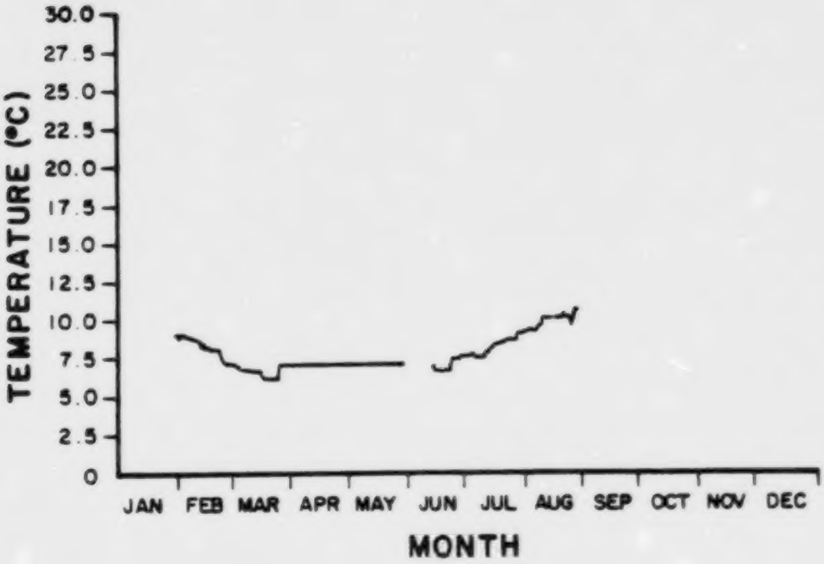
WELL 2 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	10.07	10
FEBRUARY		NO DATA		
MARCH	-	-	7.62	5
APRIL	-	-	6.97	30
MAY	-	-	6.53	10
JUNE		NO DATA		
JULY		NO DATA		
AUGUST	-	-	7.25	11
SEPTEMBER	-	-	8.18	24
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

MIXED WELLS 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST	-	-	10.18	14
SEPTEMBER	-	-	11.2	30
OCTOBER	-	-	11.98	31
NOVEMBER	-	-	11.8	30
DECEMBER	-	-	10.52	31

Well I 1983



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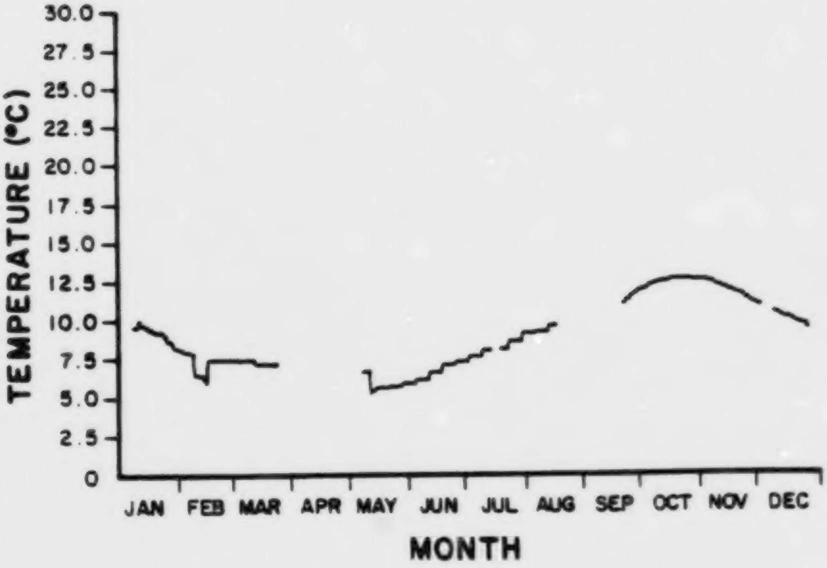
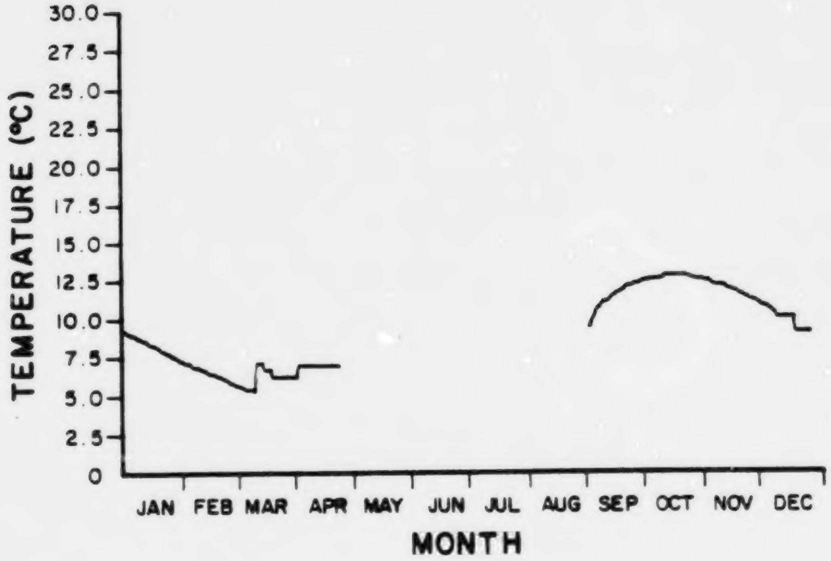
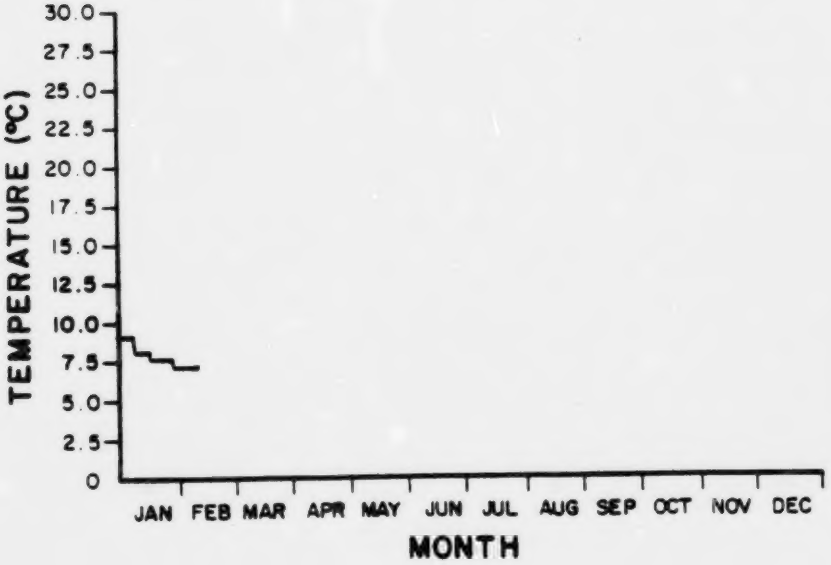


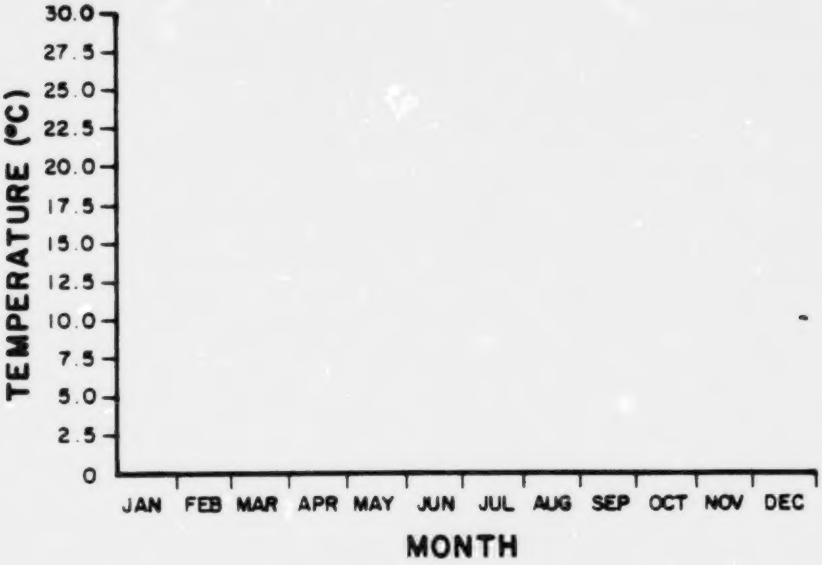
Well I 1985



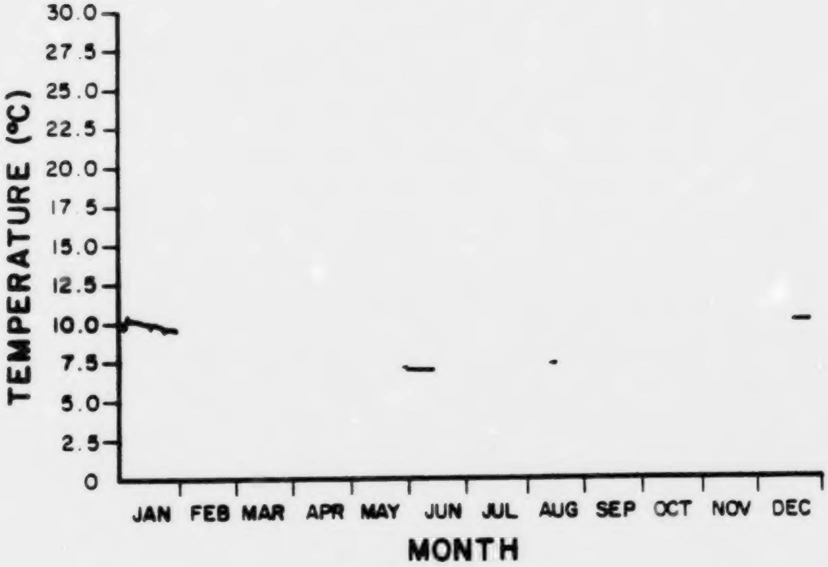
Well I 1986



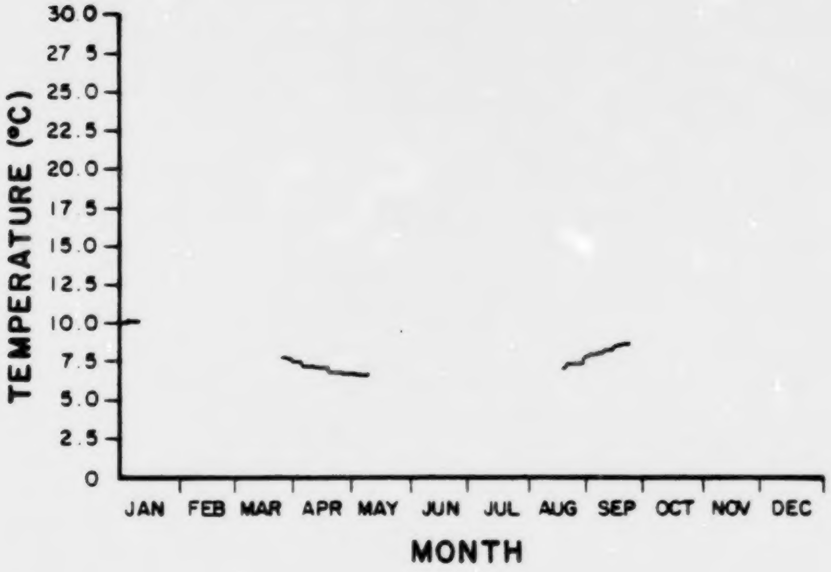
Well 2 1982



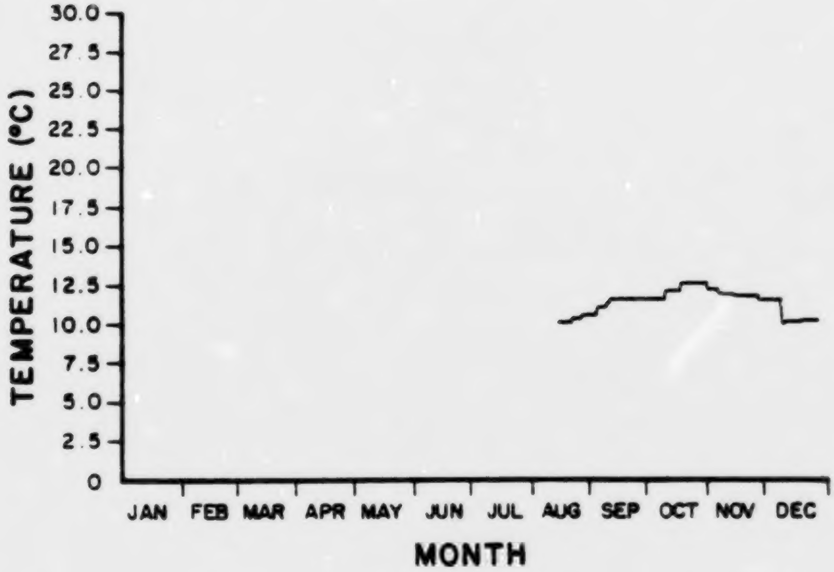
Well 2 1983



Well 2 1984



Mixed Wells 1983



Facility: KITIMAT

Location:

Located 1 km south of the town of Kitimat, 300 m downriver of the Eurocan pulp mill water intake on the Kitimat River.

Description:

The first year of full operation of the production facility was 1983; was a pilot hatchery from 1976 to 1982. The facility was built to enhance chum, chinook, coho and steelhead stocks from Kitimat and Kildala Arms.

Egg production targets in 1985 were 650 K coho, 2 M chinook, 3 M chum and 75 K steelhead. An experiment in raising cutthroat trout began in 1985. Eggs are obtained from stocks in the Kitimat, Kildala, Dala, and Bish watersheds. Juveniles are released back to their area of origin, as well as to new sites on the Kitimat River.

Water Sources:

Surface. A maximum of 45,461 lpm of water is pumped from the Kitimat River.

Groundwater. Five wells on site (wells 79-1, 80-1, 84-1, 85-1 and 85-2) provide another 13,638 lpm in total.

Other. The Eurocan pulp mill supplies hot (40 °c) mill waste water from their condenser system. This water is taken from the Kitimat River, immediately upstream of the hatchery's intake.

General Water Quality:

The groundwater is slightly soft, but otherwise of good quality. The river water is high in NFR at times. With the hot water supply from the Eurocan mill, there is a high degree of temperature control possible within the facility.

Special Notes:

Some wells have had only a few days on record in the last year for which temperature has been taken; thus no graphs or tables have been included. Water supplied by Eurocan is at a constant 40°C, barring shutdowns (both emergency and scheduled).
Additional water temperature records for well 80-1 and water quality records for the Kitimat River, wells 79-1, 80-1, and 84-1, and water supplied by Eurocan, are available in MacKinlay (1984).

WATER QUALITY VALUES FOR KITIMAT
(below detection limits = 0)

PARAMETERS	JUN16/77 EUROCAN SUPPLY	JUL12/77 EUROCAN SUPPLY	SEP28/77 EUROCAN SUPPLY	NOV22/77 EUROCAN SUPPLY	JAN23/78 EUROCAN SUPPLY	AUG17/78 EUROCAN SUPPLY	AUG31/83 EUROCAN SUPPLY	SEPT9/83 KITIMAT HOT H20	SEPT9/83 KITIMAT HOT H20	SEP16/83 KITIMAT HOT H20	SEP16/83 KITIMAT HOT H20
Alkalinity						95.7	12.5				
Ammonia						.09	.011				
CO2											
Chloride							.8				
Color											
Conductivity Field											
Conductivity Lab						194.2	35.7				
Dissolved O2-ppm						4.5					
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness		12	83			85.7	12.8	16.8	17.1	17.8	17.9
Nitrite	0	0	0	0		0	0				
Nitrate	.17	.082	.2	.22		0	.04				
pH-Field											
pH-Lab		6.8				6.8	6.9				
Phosphate							.012				
Residue-Filterable	0	0	0	0		.7	25				
Residue-Nonfilterable							9				
Silica								1.9	1.9	2	2
Sulphate							4				
Taste											
Temperature						9					
Turbidity							2.3				
METALS											
Al-Aluminum							0	.08	.1	.27	.29
As-Arsenic							0	0	0	0	0
Ba-Barium							.007	.011	.011	.012	.012
Ca-Calcium							4.5	5.4	5.5	5.1	5.2
Cd-Cadmium							0	0	0	0	0
Co-Cobalt							0	0	0	0	0
Cr-Chromium							0	0	0	0	0
Cu-Copper	0	0	0	0	0	.005	0	.001	0	.002	.002
Fe-Iron	.03	.55	.03	.05		0	0	.149	.155	.369	.38
Hg-Mercury						0		0	0	0	0
K--Potassium							.542	.527	.527	.546	.546
Mg-Magnesium							.4	.6	.6	.6	.6
Mn-Manganese							.005	.009	.009	.014	.013
Mo-Molybdenum							0	0	0	0	0
Na-Sodium							.9	1.3	1.3	1	1
Ni-Nickel							0	0	0	0	0
P--Phosphorus							0	0	0	0	0
Pb-Lead	0	0	0	0	0	.07	0	0	0	0	0
Sb-Antimony							0	0	0	0	0
Se-Selenium							0	0	0	0	0
Si-Silicon							1.5	1.9	1.8	2	2
Sn-Tin							0	0	0	0	0
Sr-Strontium							.026	.032	.032	.03	.03
Ti-Titanium							0	.003	.004	.009	.009
V--Vanadium							0	0	0	0	0
Zn-Zinc	.01	.01	.01	.01	0	.005	0	.031	.03	.029	.034

WATER QUALITY VALUES FOR KITIMAT

(below detection limits = 0)

PARAMETERS	SEP23/83 KITIMAT HOT H2O	SEP23/83 KITIMAT HOT H2O	OCT3/83 KITIMAT HOT H2O	OCT3/83 KITIMAT HOT H2O	OCT7/83 KITIMAT HOT H2O	OCT7/83 KITIMAT HOT H2O	OCT14/83 KITIMAT HOT H2O	OCT14/83 KITIMAT HOT H2O	OCT21/83 KITIMAT HOT H2O	OCT21/83 KITIMAT HOT H2O	NOV4/83 KITIMAT HOT H2O
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	18.3	18	20.4	19.9	21.2	21.3	24.7	22.8	30	30.4	18.7
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue-Filterable											
Residue-Nonfilterable											
Silica	2	1.9	2.3	2.3	2.9	2.9	3.3	3	5.5	5.8	2.6
Sulphate											
Taste											
Temperature											
Turbidity											
METALS											
Al-Aluminum	.18	.13	.2	.15	.3	.29	.48	.31	1.77	1.83	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.012	.012	.013	.013	.014	.014	.017	.015	.023	.024	.011
Ca-Calcium	5.8	5.7	6.3	6.2	6.4	6.4	7	6.8	5.4	5.4	4.5
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	.002	.001	.003	.002	.001	.001	.002	.001	.003	.003	.004
Fe-Iron	.207	.179	.3	.214	.301	.303	.528	.355	1.38	1.41	.427
Hg-Mercury	0	0	0	0	0	0	0	.0002	0	0	.00011
K—Potassium	.577	.584	.64	.621							.521
Mg-Magnesium	.8	.6	.7	.7	.7	.7	.8	.8	1	1	.6
Mn-Manganese	.011	.009	.015	.013	.013	.013	.021	.016	.039	.038	.015
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	1.4	1.4	.7	.7	1.6	1.8	1.8	1.8	1.8	1.6	1.2
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	.08	0
Pb-Lead	0	0	0	0	.001	0	.001	0	.001	.002	.002
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	2	1.9	2.3	2.3	2.9	2.9	3.3	3	5.5	5.8	2.6
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.034	.034	.036	.036	.039	.039	.042	.04	.034	.035	.028
Ti-Titanium	.006	.004	.007	.003	.011	.012	.025	.016	.077	.077	.008
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.032	.032	.085	.042	.027	.033	.08	.054	.047	.049	.057

WATER QUALITY VALUES FOR KITIMAT
(below detection limits =0)

PARAMETERS	NOV4/83 KITIMAT HOT H20	NOV10/83 KITIMAT HOT H20	NOV10/83 KITIMAT HOT H20	JAN13/84 KITIMAT HOT H20	JAN13/84 KITIMAT HOT H20	JAN20/84 KITIMAT HOT H20	JAN20/84 KITIMAT HOT H20	JAN27/84 KITIMAT HOT H20	JAN27/84 KITIMAT HOT H20	FEB3/84 KITIMAT HOT H20	FEB3/84 KITIMAT HOT H20
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	18.2	19.8	19.5	20.9	21	22.1	22	17.7	17.7	18.5	16.9
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue-Filterable											
Residue-Nonfilterable											
Silica	2.5	2.8	2.7	2.9	3	3.3	3.3	2.5	2.6	2.2	2.3
Sulfate											
Taste											
Temperature											
Turbidity											
METALS											
Al-Aluminum	.38	.17	.14	0	0	0	0	.45	.48	.12	.16
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.011	.012	.012	.012	.012	.013	.013	.012	.012	.01	.011
Ca-Calcium	4.4	6.1	6.1	6.8	6.9	7.3	7.3	4.7	4.7	5.2	5.2
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	.005	.003	.002	.002	.001	.001	0	.002	.002	0	0
Fe-Iron	.412	.275	.244	.152	.161	.18	.18	.319	.342	.15	.184
Hg-Mercury	.00015	0	.00006	.00012	0	.00058	.00005	.00043	.00034		
K--Potassium	.54	.521	.521	.58	.538	.563	.546	.62	.62	.55	.58
Mg-Magnesium	.6	.7	.7	.8	.8	.9	.9	.6	.6	.6	.6
Mn-Manganese	.015	0	0	.012	.012	.018	.018	.005	.005	.002	.002
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	1.2	1.7	1.7	2.3	2.3	2.7	2.7	1.4	1.4	1.5	1.6
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	.002	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	2.5	2.8	2.7	2.9	3	3.3	3.3	2.5	2.6	2.2	2.3
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.027	.036	.038	.042	.042	.045	.045	.028	.028	.03	.031
Ti-Titanium	.007	.005	.004	0	0	0	0	.01	.011	.003	.004
V--Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.056	.078	.088	.032	.033	.026	.05	.007	.008	.011	.011

WATER QUALITY VALUES FOR KITIMAT
(below detection limits =0)

PARAMETERS	APR13/84 KITIMAT HOT H2O	APR13/84 KITIMAT HOT H2O	APR20/84 KITIMAT HOT H2O	APR20/84 KITIMAT HOT H2O	SEP23/83 WELL 79-1	SEP23/83 WELL 79-1	OCT03/83 WELL 79-1	OCT3/83 WELL 79-1	OCT7/83 WELL 79-1	OCT7/83 WELL 79-1	OCT14/83 WELL 79-1
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	17.5	17.4	17.4	16.8	103	104	107	106	112	107	109
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue-Filterable											
Residue-Nonfilterable											
Silica	2.4	2.4	2.4	2.4	4.8	4.8	4.8	4.8	5.2	5	5.1
Sulfate											
Taste											
Temperature											
Turbidity											
METALS											
Al-Aluminum	.08	.08	.15	.11	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.011	.01	.011	.011	.015	.014	.015	.015	.017	.016	.016
Ca-Calcium	5.6	5.5	5.4	5.4	36.9	37.4	38.2	38.1	40	38.3	39
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	.005	.01	.009	.003	0	0	0	0	0	0	0
Fe-Iron	.161	.172	.209	.164	.012	.007	0	0	0	.017	.011
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K--Potassium	.5	.51	.54	.52	1.41	1.41	1.41	1.41			
Mg-Magnesium	.6	.8	.8	.8	2.6	2.6	2.7	2.7	2.9	2.8	2.9
Mn-Manganese	.01	.009	.01	.009	0	0	0	0	0	0	0
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	1.8	1.7	1.6	1.6	2.6	2.6	2.7	2.7	2.8	2.7	2.8
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	.001	0	.003	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	2.4	2.4	2.4	2.4	4.8	4.8	4.8	4.8	5.2	5	5.1
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.034	.034	.033	.033	.117	.118	.121	.121	.127	.121	.124
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V--Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.05	.071	.059	.051	.003	.003	.002	.002	.007	.01	.007

WATER QUALITY VALUES FOR KITIMAT
(below detection limits = 0)

PARAMETERS	OCT14/83 WELL 79-1	OCT21/83 WELL 79-1	OCT21/83 WELL 79-1	OCT27/83 WELL 79-1	OCT27/83 WELL 79-1	NOV4/83 WELL 79-1	NOV4/83 WELL 79-1	NOV10/83 WELL 79-1	NOV10/83 WELL 79-1	NOV18/83 WELL 79-1	NOV18/83 WELL 79-1
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	109	110	110	118	118	109	107	111	114	116	108
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue-Filterable											
Residue-Nonfilterable											
Silica	5	5.1	5.1	5.5	5.5	5.2	5.2	5.3	5.3	5.2	5.3
Sulphate											
Taste											
Temperature											
Turbidity											
METALS											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.016	.016	.016	.017	.017	.017	.018	.017	.017	.018	.018
Ca-Calcium	38.9	39.2	39.2	42.2	42.3	39.1	38.1	39.5	40.9	41.5	38.3
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	.001	0	0	0
Fe-Iron	.017	0	.007	.014	.006	0	0	0	0	0	0
Hg-Mercury	0	0	0	0	0	.00008	0	.00006	.00008	.00011	.00007
K--Potassium						1.48	1.58	1.48	1.5	1.5	1.53
Mg-Magnesium	2.8	2.9	2.9	3	3	2.8	2.8	2.9	2.9	3	2.8
Mn-Manganese	.002	0	0	0	0	0	0	0	0	0	0
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	2.8	2.9	2.8	3.2	3.2	2.9	2.8	2.9	3	3	2.9
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	5	5.1	5.1	5.5	5.5	5.2	5.2	5.3	5.3	41.5	38.3
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.124	.127	.125	.137	.136	.126	.124	.128	.134	.136	.125
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V--Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.007	.004	.004	.008	.008	.002	.003	0	0	0	0

WATER QUALITY VALUES FOR KITIMAT
(below detection limits = 0)

PARAMETERS	NOV25/83 WELL 79-1	NOV25/83 WELL 79-1	DEC2/83 WELL 79-1	DEC2/83 WELL 79-1	DEC9/83 WELL 79-1	DEC9/83 WELL 79-1	DEC16/83 WELL 79-1	DEC16/83 WELL 79-1	DEC23/83 WELL 79-1	DEC23/83 WELL 79-1	DEC30/83 WELL 79-1
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	114	115	124	124	124	128	122	123	123	125	120
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue-Filterable											
Residue-Nonfilterable											
Silica	5.3	5.2	5.8	5.8	5.6	5.7	5.8	5.6	5.8	5.7	5.5
Sulphate											
Taste											
Temperature											
Turbidity											
METALS											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.017	.018	.019	.019	.019	.019	.019	.019	.018	.019	.019
Ca-Calcium	40.7	41.2	44.3	44.3	44.4	45.1	43.7	44	43.9	44.6	42.9
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	0	0	0	0	.006	0	.006	0	.008	.008	.008
Hg-Mercury	.00008	.00007	0	0	0	0	0	0	0	0	.00008
K--Potassium	1.56	1.53	1.44	1.37	1.37		1.31	1.37	1.31	1.44	1.56
Mg-Magnesium	3	3	3.2	3.2	3.2	3.2	3.2	3.2	3.1	3.2	3
Mn-Manganese	0	0	0	0	0	0	0	0	0	0	0
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	2.9	2.9	3.1	3.2	3.3	3.3	3.3	3.4	3.4	3.4	3.3
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	40.7	41.2	5.8	5.6	5.8	5.7	5.8	5.6	5.8	5.7	5.5
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.133	.134	.144	.144	.145	.146	.143	.144	.144	.146	.14
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V--Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.004	.005	.005	.005	.008	.006	.005	.005	.01	.007	.115

WATER QUALITY VALUES FOR KITIMAT
(below detection limits = 0)

PARAMETERS	JAN13/84 WELL 79-1	JAN13/84 WELL 79-1	JAN20/84 WELL 79-1	JAN20/84 WELL 79-1	JAN27/84 WELL 79-1	JAN27/84 WELL 79-1	FEB3/84 WELL 79-1	FEB3/84 WELL 79-1	FEB10/84 WELL 79-1	FEB10/84 WELL 79-1	MAR09/84 WELL 79-1
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	123	124	123	123	122	123	127	128	127	127	122
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue-Filterable											
Residue-Nonfilterable											
Silica	5.6	5.7	5.6	5.6	5.5	5.5	5.6	5.8	5.5	5.5	5.4
Sulphate											
Taste											
Temperature											
Turbidity											
METALS											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.018	.019	.016	.018	.018	.018	.019	.019	0	.014	.018
Ca-Calcium	44	44.4	44.3	44.1	43.6	43.9	45.4	45.6	45.5	45.6	43.9
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	0	0	0	.008	0	0	0	0	0	0	0
Hg-Mercury	.00012	.00008	.00005	.00007	.00026	.00011			0	0	0
K—Potassium	1.56	1.56	1.56	1.56	1.71	1.71	1.69	1.7	1.72	1.76	1.62
Mg-Magnesium	3.1	3.1	3.1	3.1	3.2	3.2	3.3	3.3	3.3	3.3	3
Mn-Manganese	0	0	0	0	0	0	0	0	0	0	0
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	3.2	3.3	3.3	3.3	3.4	3.4	3.3	3.4	3.6	3.7	3.5
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	.12	0	0
Si-Silicon	5.6	5.7	5.6	5.6	5.5	5.5	5.6	5.6	5.5	5.5	5.4
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.143	.145	.143	.143	.141	.143	.146	.147	.147	.148	.142
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.083	.059	.006	.034	0	0	0	0	.003	0	.005

WATER QUALITY VALUES FOR KITIMAT
(below detection limits = 0)

PARAMETERS	MAR09/84 WELL 79-1	APR6/84 WELL 79-1	APR6/84 WELL 79-1	APR13/84 WELL 79-1	APR13/84 WELL 79-1	APR20/84 WELL 79-1	APR20/84 WELL 79-1	MAY8/84 WELL 79-1	MAY8/84 WELL 79-1	MAY16/84 WELL 79-1	MAY16/84 WELL 79-1
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	119	114	114	114	114	113	111	122	119	120	120
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue-Filterable											
Residue-Nonfilterable											
Silica	5.3	5.1	5.1	5.1	5.1	5.1	5.1	5.4	5.3	5.4	5.4
Sulphate											
Taste											
Temperature											
Turbidity											
METALS											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.017	.016	.016	.016	.016	.016	.016	.018	.017	.017	.017
Ca-Calcium	42.7	40.9	41.2	41.1	41	40.7	40	43.9	42.7	43.2	43.2
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	.003	0	0	.004	0	0	0	0
Fe-Iron	0	0	0	0	0	0	0	0	0	0	0
Hg-Mercury	0	0	0	0	0	0	0	0	0	.00007	.00007
K--Potassium	1.62	1.64	1.63	1.63	1.63	1.64	1.65	1.62	1.62	1.61	1.61
Mg-Magnesium	3	2.8	2.8	2.8	2.8	2.8	2.7	3	3	3	3
Mn-Manganese	0	0	0	0	0	0	0	0	0	0	0
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	3.4	3.3	3.3	3.4	3.4	3.3	3.2	3.5	3.4	3.4	3.5
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	.001	0	.002	.001	0	0	.001	.001	.001	.001
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	5.3	5.1	5.1	5.1	5.1	5.1	5.1	5.4	5.3	5.4	5.4
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.137	.131	.133	.132	.133	.131	.128	.142	.137	.139	.138
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V--Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.016	.016	.017	.016	.01	.002	.028	.006	.016	.008	.035

WATER QUALITY VALUES FOR KITIMAT
(below detection limits =0)

PARAMETERS	MAY30/84 WELL 79-1	MAY30/84 WELL 79-1	SEPT8/83 WELL 80-1	SEP16/83 WELL 80-1	SEP16/83 WELL 80-1	SEP23/83 WELL 80-1	SEP23/83 WELL 80-1	OCT3/83 WELL 80-1	OCT3/83 WELL 80-1	OCT7/83 WELL 80-1	OCT7/83 WELL 80-1
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	122	116	17.8	18.2	17.5	17.3	17.4	18	17.9	20.1	20.9
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue-Filterable											
Residue-Nonfilterable											
Silica			3.3	3.4	3.2	3.2	3.3	3.3	3.3	3.6	3.6
Sulphate											
Taste											
Temperature											
Turbidity											
METALS											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.018	.017	.006	.006	.005	.006	.005	.005	.006	.007	.007
Ca-Calcium	43.9	42.7	5.9	6.1	5.9	5.8	5.8	6	6	6.8	6.8
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	.001	.001	.002	.001	.002	.001	.002	.001	.002
Fe-Iron	0	0	.02	.023	.026	.032	.031	.024	.03	.036	.228
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K--Potassium	1.62	1.62	.666	.668	.668	.673	.673	.686	.692		
Mg-Magnesium	0	0	.8	.7	.7	.8	.8	.7	.7	.8	.8
Mn-Manganese	0	0	.009	.008	.008	.008	.008	.006	.008	.008	.042
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	3.5	3.4	1.7	1.8	1.7	1.7	1.7	1.7	1.8	1.9	2
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	.001	.001	0	0	.002	.001	.001	0	0	0	.001
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	5.4	5.3	3.3	3.4	3.2	3.2	3.3	3.3	3.3	3.6	3.6
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.142	.137	.037	.037	.035	.035	.036	.036	.036	.04	.042
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V--Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.005	.018	.007	.008	.01	.009	.011	.008	.008	.008	.009

WATER QUALITY VALUES FOR KITIMAT
(below detection limits =0)

PARAMETERS	OCT14/83 WELL 80-1	OCT14/83 WELL 80-1	OCT21/83 WELL 80-1	OCT21/83 WELL 80-1	OCT27/83 WELL 80-1	OCT27/83 WELL 80-1	NOV4/83 WELL 80-1	NOV4/83 WELL 80-1	NOV10/83 WELL 80-1	NOV10/83 WELL 80-1	DEC2/83 WELL 80-1
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	21.2	21.4	21.1	21.2	20.2	20.1	21.1	20.7	23.8	23.8	27.2
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue-Filterable											
Residue-Nonfilterable											
Silica	3.6	3.7	3.8	3.6	3.8	3.7	3.8	3.6	3.8	3.9	4.1
Sulphate											
Taste											
Temperature											
Turbidity											
METALS											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.007	.007	.007	.007	.007	.008	.007	.007	.008	.008	.009
Ca-Calcium	7.1	7.1	7	7	6.9	6.7	7	6.9	8	8	9.1
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	.001	0	.001	0	.002	.002	.001	.001	.001
Fe-Iron	.031	.025	.035	.046	.028	.031	.032	.03	.029	.03	.054
Hg-Mercury	0	0	0	0	0	0	.00008	0	.00008	0	0
K--Potassium							.742	.673	.693	.693	.671
Mg-Magnesium	.8	.8	.8	.8	.8	.8	.8	.8	.9	.9	1
Mn-Manganese	.011	.01	.015	.014	.015	.014	.015	.015	.017	.017	.023
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	2	2	1.9	1.9	1.9	1.9	1.9	1.8	2	2	2.2
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	.001	.003	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	3.6	3.7	3.8	3.6	3.8	3.7	3.8	3.6	3.8	3.9	4.1
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.043	.044	.043	.042	.043	.042	.044	.043	.049	.049	.056
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V--Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.007	.004	.008	.007	.009	.009	.008	.009	.007	.007	.014

WATER QUALITY VALUES FOR KITIMAT
(below detection limits =0)

PARAMETERS	DEC9/83 WELL 80-1	DEC9/83 WELL 80-1	DEC16/83 WELL 80-1	DEC16/83 WELL 80-1	DEC23/83 WELL 80-1	DEC23/83 WELL 80-1	DEC30/83 WELL 80-1	DEC30/83 WELL 80-1	JAN13/84 WELL 80-1	JAN13/84 WELL 80-1	JAN20/84 WELL 80-1
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	26.5	28.2	25.2	24.5	23.7	23	22.7	21.9	23.7	23.7	26
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue-Filterable											
Residue-Nonfilterable											
Silica	4.1	4.4	4.1	4	3.9	3.8	3.7	3.7	3.7	3.7	3.9
Sulphate											
Taste											
Temperature											
Turbidity											
METALS											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.009	.008	.009	.008	.008	.008	.007	.006	.007	.007	.008
Ca-Calcium	8.9	9.4	8.4	8.2	7.9	7.8	7.5	7.4	7.9	7.9	8.7
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	.003	.001	0	.002	.001	0	0	0	0	0
Fe-Iron	.039	.041	.037	.039	.041	.037	.029	.025	.022	.022	.027
Hg-Mercury	0	0	0	0	0	0	.00008	.00012	.00005	.00005	.00005
K--Potassium	.898	.828	.789	.769	.816	.832	.689	.723	.672	.681	.698
Mg-Magnesium	1	1.1	1	.9	.9	.9	.9	.9	.9	.9	1
Mn-Manganese	.025	.027	.027	.026	.025	.024	.02	.018	.018	.018	.019
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	2.1	2.3	2.1	2	2	1.9	2	1.9	2	1.9	2.1
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	4.1	4.4	4.1	4	3.9	3.8	3.7	3.7	3.7	3.7	3.9
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.054	.058	.051	.048	.047	.047	.045	.045	.048	.048	.051
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V--Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.01	.01	.011	.01	.014	.011	.008	.007	.007	.007	.007

WATER QUALITY VALUES FOR KITIMAT

(below detection limits =0)

PARAMETERS	JAN20/84 WELL 80-1	JAN27/84 WELL 80-1	JAN27/84 WELL 80-1	FEB3/84 WELL 80-1	FEB3/84 WELL 80-1	FEB10/84 WELL 80-1	FEB10/84 WELL 80-1	MAR09/84 WELL 80-1	MAR09/84 WELL 80-1	APR9/84 WELL 80-1	APR9/84 WELL 80-1
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	25.7	24.6	24.3	25.3	24.5	25.7	26.5	29.1	29.1	25.6	25.8
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue-Filterable											
Residue-Nonfilterable											
Silica	3.8	3.5	3.5	3.5	3.4	3.5	3.5			3.6	3.8
Sulphate											
Taste											
Temperature											
Turbidity											
METALS											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.008	.008	.007	.008	.007	0	0	.006	.006	.008	.008
Ca-Calcium	8.8	8.3	8.2	8.5	8.2	8.8	8.5	9.8	9.8	8.5	8.5
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	.001	.001	0	0	.004	.004
Fe-Iron	.034	0	0	.006	0	.01	.01	.039	.047	.032	.032
Hg-Mercury	.00012	.00011				0	0	0	0	0	0
K—Potassium	.898	.79	.79	.77	.78	.79	.78	.78	.78	.71	.71
Mg-Magnesium	1	1	1	1	1	1	1	1.2	1.1	1	1
Mn-Manganese	.019	.02	.02	.021	.021	.024	.024	.039	.039	.062	.061
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	2	2	1.9	2	2	2	2	2.2	2.2	2	2
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	3.8	3.5	3.5	3.5	3.4	3.5	3.5	3.9	3.9	3.6	3.6
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.052	.051	.05	.05	.049	.051	.052	.058	.059	.051	.05
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.009	.008	.002	.002	0	.137	.07	.011	.037	.01	0

WATER QUALITY VALUES FOR KITIMAT
(below detection limits =0)

PARAMETERS	APR13/84 WELL 80-1	APR13/84 WELL 80-1	APR20/84 WELL 80-1	APR20/84 WELL 80-1	MAY9/84 WELL 80-1	MAY9/84 WELL 80-1	MAY16/84 WELL 80-1	MAY16/84 WELL 80-1	MAY30/84 WELL 80-1	MAY30/84 WELL 80-1	DEC21/84 900 WELL84-1
Alkalinity											70.2
Ammonia											.014
CO2											
Chloride											28.2
Color											
Conductivity Field											230
Conductivity Lab											430
Dissolved O2-ppm											2
Dissolved O2-%sat											16.8
Dissolved Gas Tot											103.4
Dissolved Nitrogen											126.4
Hardness	25	24.8	24.8	24.2	28.4	29.5	28.7	28.8	28.2	26.7	193
Nitrite											0
Nitrate											.06
pH-Field											7.3
pH-Lab											7.9
Phosphate											.005
Residue-Filterable											276
Residue-Nonfilterable											0
Silica	3.8	3.8	3.5	3.8	3.9	3.9	3.8	3.9	3.6	3.8	
Sulphate											88
Taste											
Temperature											8
Turbidity											.2
METALS											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.007	.007	.007	.007	.009	.009	.009	.009	.008	.008	.04
Ca-Calcium	8.3	8.4	8.2	8.1	9.8	9.8	9.5	9.5	8.6	8.9	63.1
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	.003	.004	.005	0	0	0	.001	.002	.004	.001	0
Fe-Iron	.038	.033	.036	.025	.039	.047	.041	.041	.042	.037	.02
Hg-Mercury	0	0	0	0	0	0	.00005	0	0	0	0
K—Potassium	.7	.71	.7	.71	.78	.78	.75	.74	.7	.71	
Mg-Magnesium	1	1	1	.9	1.2	1.1	1.1	1.1	1	1	8.4
Mn-Manganese	.053	.064	.068	.065	.039	.039	.044	.046	.054	.043	.003
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	2	2	2	2	2.2	2.2	2.1	2.1	2	2.1	7
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	3.8	3.8	3.5	3.6	3.9	3.9	3.9	3.9	3.6	3.8	5.3
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.048	.05	.049	.049	.058	.059	.057	.057	.05	.053	.544
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.007	.012	.018	.017	.011	.037	.008	.007	.012	.004	0

WATER QUALITY VALUES FOR KITIMAT
(below detection limits =0)

PARAMETERS	DEC16/84 1500 WELL84-2	DEC17/84 1300 WELL84-2	DEC18/84 1300 WELL84-2	DEC19/84 1400 WELL84-3	DEC20/84 1100 WELL84-3	MAY30/77 KITIMAT RIVER	JUL5/77 KITIMAT RIVER	SEP/77 KITIMAT RIVER	SEP28/77 KITIMAT RIVER	OCT/77 KITIMAT RIVER	NOV22/77 KITIMAT RIVER
Alkalinity	68.5	65.7	64.8	68.3	68.3						
Ammonia	.005	0	.008	0	0			.005-.82		.017-.049	
CO2											
Chloride	5.5	5.8	5.4	5.3	7.3						
Color											
Conductivity Field	110	115	113	140	130						
Conductivity Lab	185	185	185	195	205			35-245		22-44	
Dissolved O2-ppm	3.3	3		2.6	1.4			10.05-11		8.8-11.5	
Dissolved O2-%sat	28.1	23.6		21	11.4						
Dissolved Gas Tot	110.7	104.1		113.2	110.7						
Dissolved Nitrogen	133.1	125.5		137.7	137						
Hardness	88.9	88.1	87.5	87.2	90.3		11		17		
Nitrite	0	0	0	0	0	0	0	0	0	0	0
Nitrate	.1	.1	.1	.01	.01	.12	.028	<.01-.098	0	.11-1.1	.12
pH-Field	7.1	7.1	6.9	7.3							
pH-Lab	7.9	7.9	7.9	7.8	7.9		7.2	6.7-7.1		6.6-7	
Phosphate	.008	.008	.007	.007	.007						
Residue-Filterable	115	116	115	118	128	0	0	0	0	27-60	0
Residue-Nonfilterable	0	0	0	0	0						
Silica											
Sulphate	13	14	14	18	19						
Taste											
Temperature	6.1	6.1	6.2	6.4	6.4						
Turbidity	2.3	1.1	1.1	.4	.1						
METALS											
Al-Aluminum	.09	0	0	0	0						
As-Arsenic	0	0	0	0	0						
Ba-Barium	.051	.03	.028	.045	.047						
Ca-Calcium	30.1	30.2	29.9	29.6	30.6						
Cd-Cadmium	0	0	0	0	0						
Co-Cobalt	0	0	0	0	0						
Cr-Chromium	0	0	0	0	0						
Cu-Copper	.007	0	0	0	0	0	0		0		0
Fe-Iron	.057	.031	.014	.029	.018	.1	.13		.16		.28
Hg-Mercury	0	0	0	0	0						
K--Potassium											
Mg-Magnesium	3	3	3	3.1	3.3						
Mn-Manganese	.281	.054	.019	.003	.008						
Mo-Molybdenum	0	0	0	0	0						
Na-Sodium	2.4	2.4	2.3	2.8	3.1						
Ni-Nickel	0	0	0	0	0						
P--Phosphorus	0	0	0	.05	.06						
Pb-Lead	0	0	0	0	0	0	0		0		0
Sb-Antimony	0	0	0	0	0						
Se-Selenium	0	0	0	0	0						
Si-Silicon	5.6	5.5	5.4	4.8	4.9						
Sn-Tin	0	0	0	0	0						
Sr-Strontium	.093	.093	.092	.095	.099						
Ti-Titanium	0	0	0	0	0						
V--Vanadium	0	0	0	0	0						
Zn-Zinc	0	0	0	0	0	.01	.01		.01		.01

WATER QUALITY VALUES FOR KITIMAT
(below detection limits = 0)

PARAMETERS	AUG/78 KITIMAT RIVER	JAN/79 KITIMAT RIVER	OCT/80 KITIMAT RIVER	NOV/80 KITIMAT RIVER	DEC18/84 KITIMAT RIVER	DEC21/84 KITIMAT RIVER
Alkalinity	?.3				16.8	18.4
Ammonia	.06				.01	.008
CO2						
Chloride	.98				3.1	2.4
Color						
Conductivity Field					37	63
Conductivity Lab	32.7				58	56
Dissolved O2-ppm	?.4				14	14.8
Dissolved O2-%sat					95.4	101.3
Dissolved Gas Tot					100.9	101.3
Dissolved Nitrogen					102.4	101.3
Hardness	?.3				23.8	21.5
Nitrite	0				0	0
Nitrate	.01				.1	.12
pH-Field					7	7.6
pH-Lab	6.55				6.8	7
Phosphate					.011	.006
Residue-Filterable			9-246	14-78	46	44
Residue-Nonfilterable					0	0
Silica						
Sulphate					5	4
Taste						
Temperature	12		5.5-9		.5	.3
Turbidity					4.3	3.6
METALS						
Al-Aluminum					.24	.13
As-Arsenic					0	0
Ba-Barium					.018	.015
Ca-Calcium					6.9	6.5
Cd-Cadmium					0	0
Co-Cobalt					0	0
Cr-Chromium					0	0
Cu-Copper	.22	0			0	0
Fe-Iron	.1	0			.462	.333
Hg-Mercury	.02	.00142			0	0
K—Potassium						
Mg-Magnesium					1	.9
Mn-Manganese					.041	.031
Mo-Molybdenum					0	0
Na-Sodium					2.8	2.2
Ni-Nickel					0	0
P—Phosphorus					0	0
Pb-Lead		0			0	0
Sb-Antimony					0	0
Se-Selenium					0	0
Si-Silicon					3.7	3.1
Sn-Tin					0	0
Sr-Strontium					.042	.042
Ti-Titanium					.003	0
V—Vanadium					0	0
Zn-Zinc	.06	0			0	0

KITIMAT RIVER 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-1.8	1.8	.93	9
FEBRUARY	1	3.3	2.24	23
MARCH	1.9	6.2	3.76	27
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

KITIMAT RIVER 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.1	2.3	1	25
FEBRUARY	0	2.3	.91	25
MARCH	.9	5.8	2.93	31
APRIL	2	7.3	4.53	26
MAY	3.7	9.7	6.56	18
JUNE	5.3	11.8	7.76	28
JULY	7	14	10.02	31
AUGUST	8.2	13.9	10.75	31
SEPTEMBER	6.3	13.4	9.18	30
OCTOBER	7.8	9	8.4	1
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

KITIMAT RIVER 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-2.2	.5	.19	26
FEBRUARY	.5	1	.72	15
MARCH	.5	4.5	1.26	30
APRIL	2	7.8	4.29	30
MAY	4	10.5	6.45	31
JUNE	5.5	13	8.82	30
JULY	8	15	10.52	31
AUGUST	9.5	15.5	12.28	31
SEPTEMBER	8.5	14.5	10.6	30
OCTOBER	4	11	7.27	31
NOVEMBER	1	5.5	3.44	22
DECEMBER	.25	.5	.35	14

KITIMAT RIVER 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER	0	0	0	8
DECEMBER	0	.9	.08	16

KITIMAT RIVER 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	2	.61	28
FEBRUARY	0	3.2	.89	25
MARCH	0	5.7	2.79	31
APRIL	2	9	4.94	30
MAY	5.5	7.7	6.6	1
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

WELL 79-1 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	-	-	6.8	3
NOVEMBER	-	-	6.9	4
DECEMBER	-	-	6.92	5

WELL 79-1 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	7	3
FEBRUARY	-	-	7	4
MARCH	-	-	6.88	4
APRIL	-	-	6.73	3
MAY	-	-	6.67	3
JUNE	-	-	6.7	5
JULY	-	-	6.68	4
AUGUST	-	-	6.76	5
SEPTEMBER	-	-	6.8	2
OCTOBER	-	-	6.84	8
NOVEMBER	-	-	6.95	8
DECEMBER	-	-	6.92	5

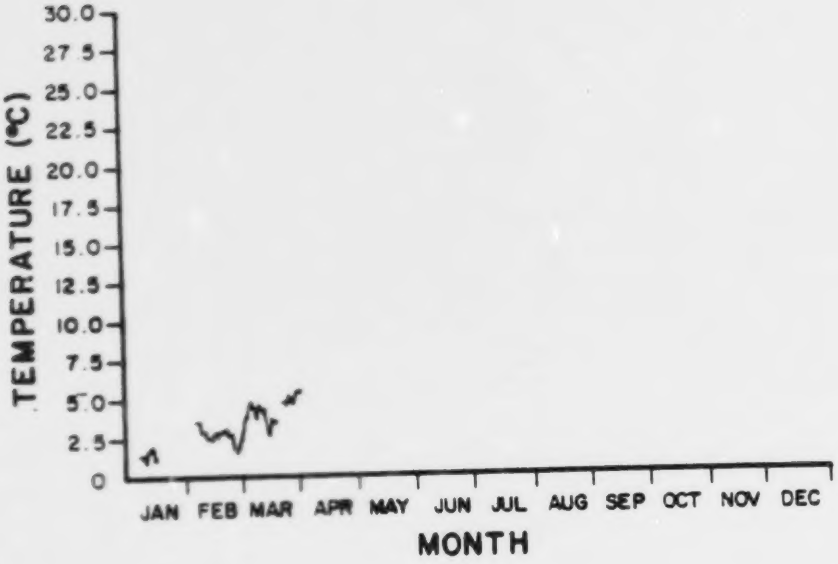
WELL 80-1 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL	6.2	7	6.43	20
MAY	6	6.8	6.35	24
JUNE	6	6.8	6.33	30
JULY	6	6.6	6.23	27
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

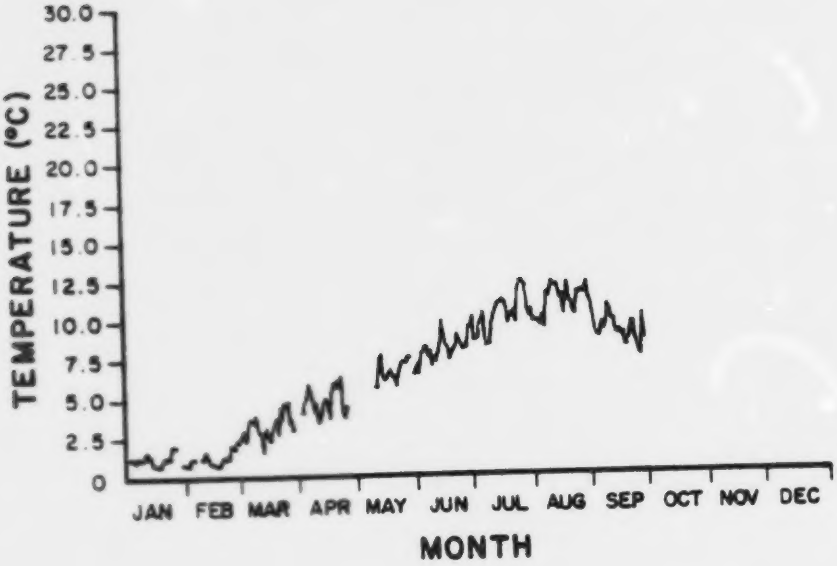
WELL 80-1 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	-	-	8.84	5
NOVEMBER	-	-	9.1	1
DECEMBER	-	-	8.6	5

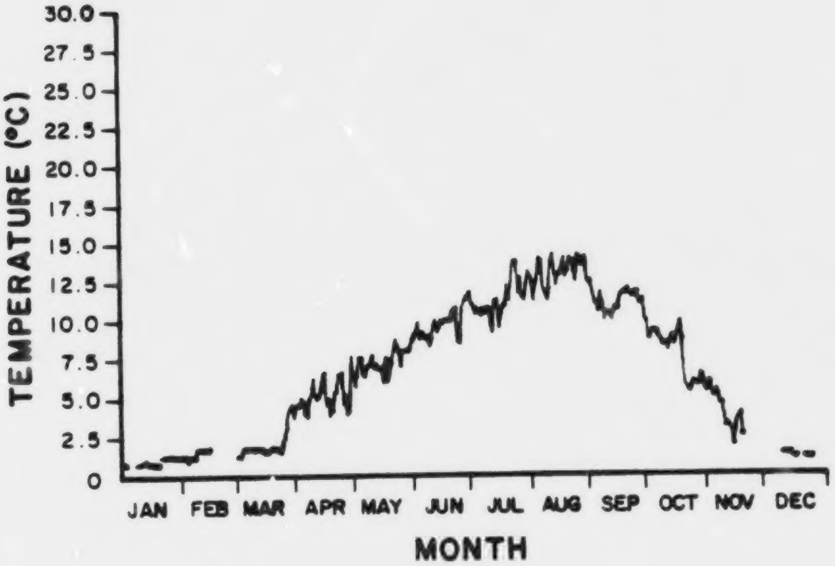
Kitimat River 1984



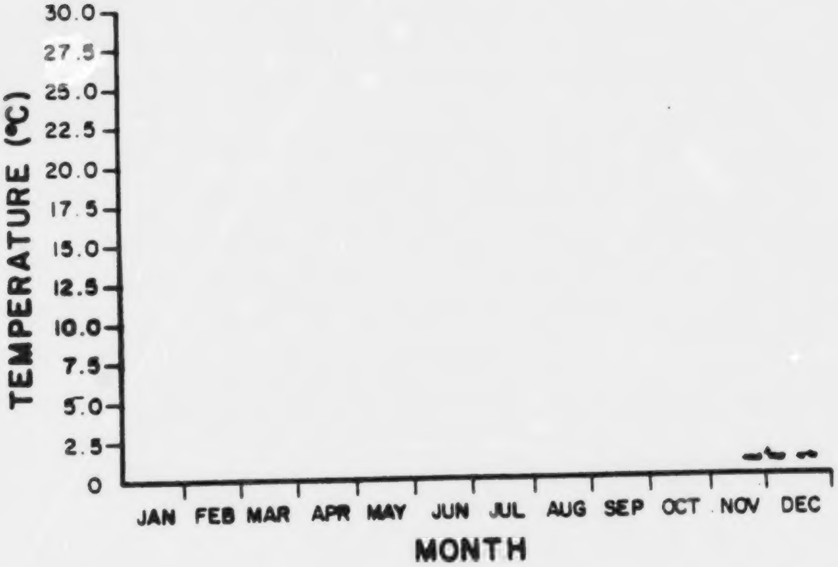
Kitimat River 1985



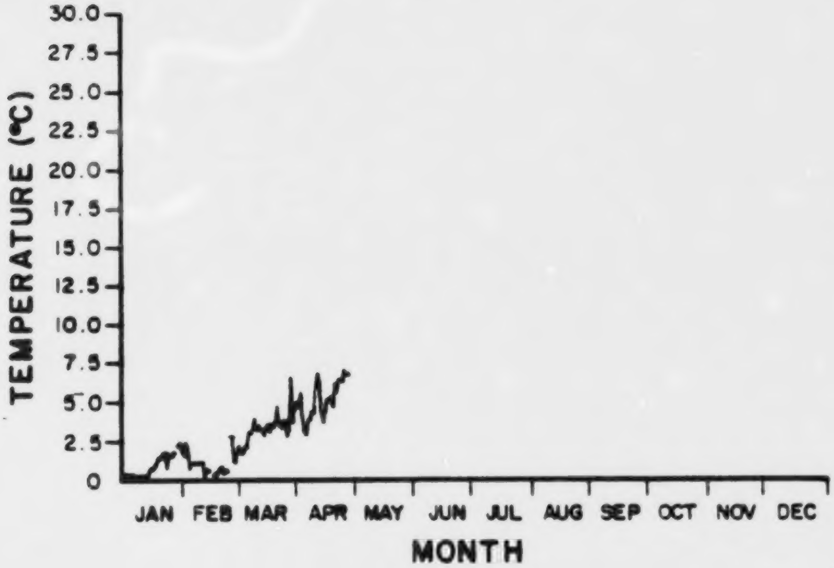
Kitimat River 1982



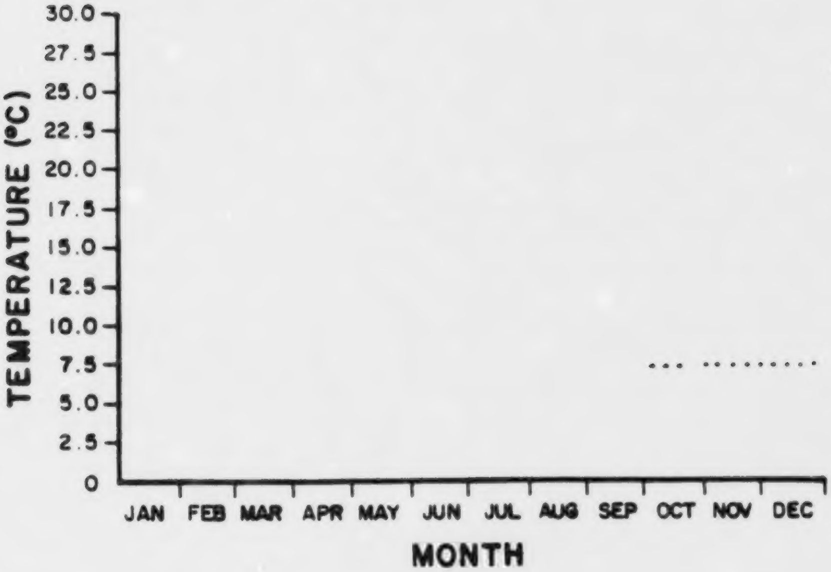
Kitimat River 1983



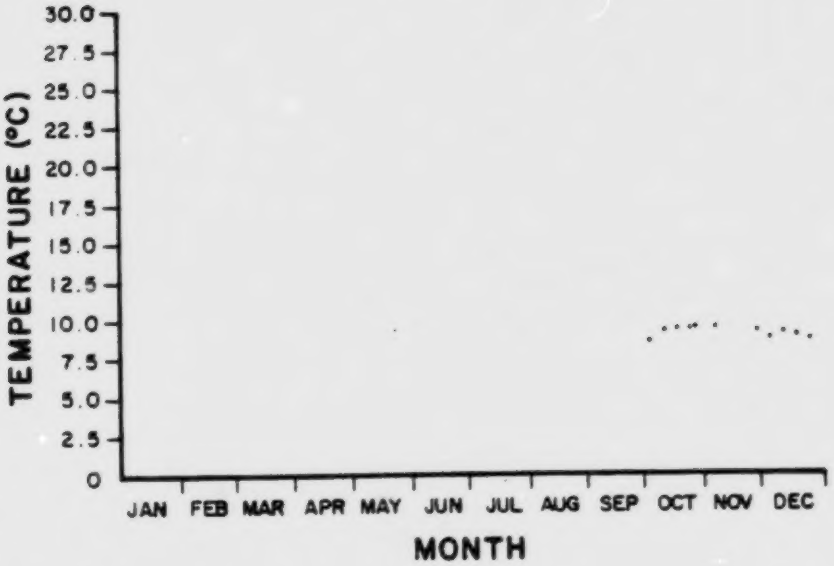
Kitimat River 1986



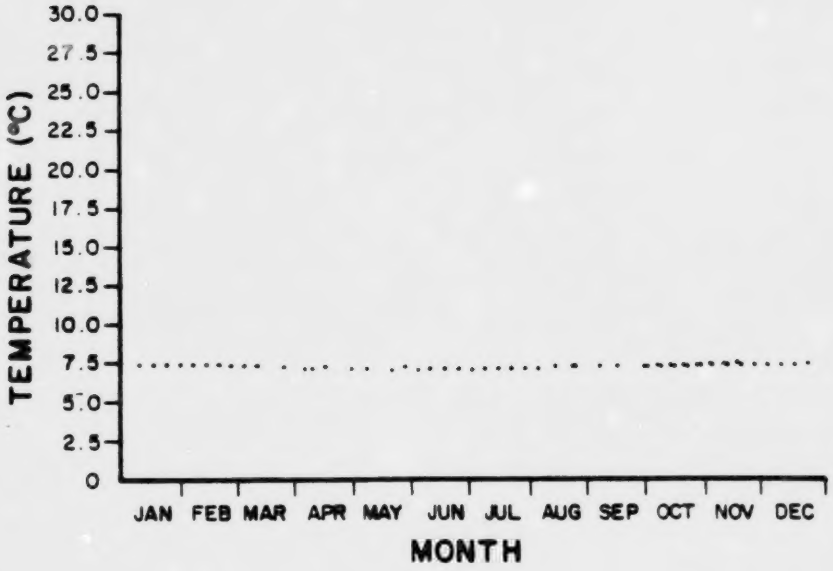
Well 79-1 1983



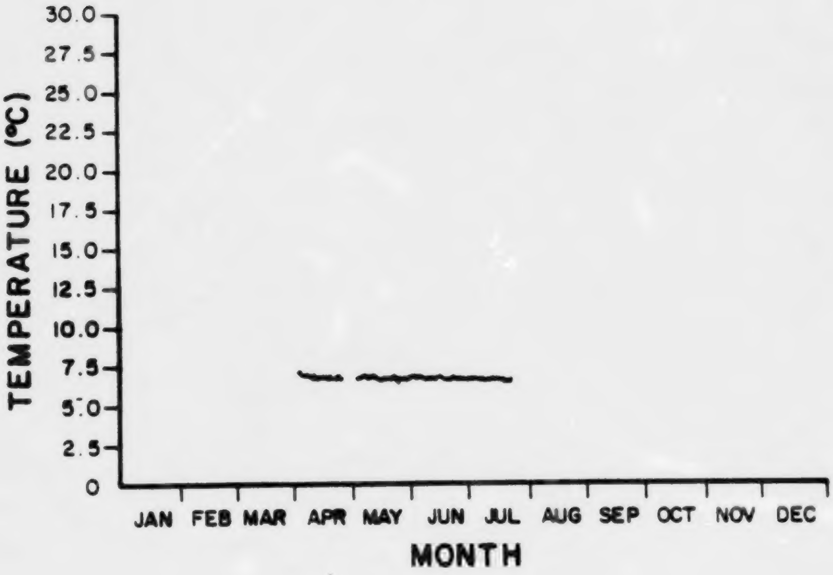
Well 80-1 1983



Well 79-1 1984



Well 80-1 1980



Facility: LITTLE QUALICUM

Location:

Located on the Little Qualicum River, 2 km north of Qualicum Beach on the east coast of Vancouver Island.

Description:

The facility began operation in 1980. It includes an artificial spawning channel for chum salmon and a rearing channel for juvenile chinook and steelhead trout. All fish for the rearing program are supplied by the Big Qualicum hatchery.

Production targets for 1985 were 2.1 M chinook eggs, 75 M chum eggs and 25 K steelhead fry. Eggs are taken from the Little Qualicum River and the Big Qualicum hatchery. Chinook and steelhead incubation takes place at the Big Qualicum hatchery. Juveniles are released into the Little Qualicum River and (for steelhead) Cameron Lake.

Water Sources:

Surface. Most of the water is supplied by the Little Qualicum River.

Groundwater. Water is added to the rearing channels from a spring which passes through a small swamp.

General Water Quality:

Good, except for silting during heavy rainfall. There is no provision for water temperature control.

Special Notes:

Water temperatures are monitored at the entrance to the spawning channel, and at the outlet of the spring prior to mixing with river water in the rearing channel. Water samples also were taken from the domestic well on the site, in response to complaints as to palatability and staining problems.

WATER QUALITY VALUES FOR LITTLE QUALICUM
(below detection limits = 0)

PARAMETERS	MAY08/80 SPAWNING ENTRANCE	JAN13/83 SPAWNING ENTRANCE	MAR13/84 SPAWNING ENTRANCE	MAY08/80 REARING CHANNEL	JAN13/83 REARING CHANNEL	MAR13/84 REARING CHANNEL	MAY08/80 DOMESTIC WELL	JAN13/83 DOMESTIC WELL	MAR13/84 DOMESTIC WELL	MAR13/84 SWAMP
Alkalinity	33.3	30	28	56.7	47	28	168		34	46
Ammonia	0	.006	.006	0	.07	.008	0		.006	.026
CO2										
Chloride	1.66	1.6	1.5	2.25	2.5	1.4	2.62		1.6	2
Color										
Conductivity Field										
Conductivity Lab	74	67.5	67.1	122	108	67.1	329		80.7	105.8
Dissolved O2-ppm										
Dissolved O2-%sat		100.63	99.31		58.04	106.88		97.75	104.21	75.81
Dissolved Gas Tot		102.23	100.67		92.67	102.02		100.13	103.11	99.19
Dissolved Nitrogen		102.7	101.08		101.89	100.78		100.81	102.86	105.43
Hardness	35.5	31.7	31	59.4	50.2	30.8		40.3	35	53.8
Nitrite	0	0	0	0	0	0	0		0	0
Nitrate	.0206	.05	.02	.0479	.15	.03	.0257		.08	.07
pH-Field	7.7	7.2	7.42	7	8.01-	7.95		8.9	7.7	6.87
pH-Lab	7.7			7	7.2		6.8			
Phosphate	.0054	.009	.004	.0164	.023	.004	.0065		.007	.028
Residue Filterable	48	51	51	93	99	54	217		71	94
Residue Non-Filter	0	0	0	0	0	0	0		0	0
Silica	2.47	2.5	2.7	7.93	7.3	2.6	12.1		9.7	7.2
Sulphate	2.3	2.8	2.2	3.1	3.4	2.2	4.1		2.3	3.8
Taste										
Temperature		5.8	5.7		5	6.2		6.2	7.4	6.4
Turbidity	0						2.8			
METALS--										
Al-Aluminum	0	.14	0	0	.09	0	0	0	0	0
As-Arsenic	0			0			0			
Ba-Barium	.0051			.0039			.0092			
Ca-Calcium	12	10.3	10.2	17.5	14.6	10.2	46.4	10.7	9.4	14.5
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0			0			0			
Cr-Chromium	0			0			0			
Cu-Copper	0	.001	0	0	.001	0	.006	0	0	0
Fe-Iron	.069	.093	.069	1.65	2.65	.049	1.25	.032	.031	2.53
Hg-Mercury	0	0		0	0		.0002	0		
K--Potassium	.117	.18	.28	.226	.37	.16	.457	.33	.24	.41
Mg-Magnesium	1.34	1.2	1.2	3.82	3.3	1.2	11.7	3.2	2.7	3
Mn-Manganese	.0039	0	.102	.132	.142	.017	.219	.001	.133	.149
Mo-Molybdenum	0			0			0			
Na-Sodium	1.25	1.9	1.6	2.8	3.6	1.2	3.42	3.7	2.4	2.8
Ni-Nickle	0			0			0			
P--Phosphorus	0			0			0			
Pb-Lead	0	0	.001	0	0	0	.0086	0	0	.001
Sb-Antimony	0			0			0			
Se-Selenium	0			0			0			
Si-Silicon	2.39			7.66			11.2			
Sn-Tin	0			0			0			
Sr-Strontium	.0225			.0383			.102			
Ti-Titanium	0			0			0			
V--Vanadium	0			0			0			
Zn-Zinc	0	0	.015	.0195	0	.004	10.8	0	.002	.012

LITTLE QUALICUM RIVER 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	12.2	21	14.16	16
OCTOBER	8.7	16.3	11.68	31
NOVEMBER	8.2	12	10.35	13
DECEMBER		NO DATA		

LITTLE QUALICUM RIVER 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	5.2	7.9	6.58	13
FEBRUARY		NO DATA		
MARCH	5.3	7.8	6.5	1
APRIL		NO DATA		
MAY	8.2	15.6	11	31
JUNE	10.8	15.4	12.91	12
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	6.7	10.2	8.78	5
NOVEMBER	6.1	10.6	8.45	30
DECEMBER	3.2	7.1	5.61	31

LITTLE QUALICUM RIVER 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.9	5.1	3.54	31
FEBRUARY	2.6	6	4.18	28
MARCH	3.2	7.6	5.29	31
APRIL	4.9	11.6	7.52	30
MAY	7	16.2	10.93	31
JUNE	11.2	16.7	13.67	10
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	8.1	14.1	11.53	31
NOVEMBER	4.4	10.7	7.34	30
DECEMBER	4.2	7.7	5.93	31

LITTLE QUALICUM RIVER 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	4.6	6.6	5.56	31
FEBRUARY	4.1	7.9	5.78	28
MARCH	3.8	9.3	6.36	31
APRIL	5.3	13.1	8.55	30
MAY	8.6	18.3	12.27	31
JUNE	13.1	19.5	15.35	15
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	8.2	11.7	9.9	20
NOVEMBER	4.8	10.8	8.18	30
DECEMBER	.9	6.2	4.26	31

LITTLE QUALICUM RIVER 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.4	6.3	4.35	31
FEBRUARY	3	6.8	4.84	28
MARCH	3.7	10	6.51	31
APRIL	5.8	13	8.45	30
MAY	7.7	14.7	10.4	31
JUNE	10.2	19.6	14.49	28
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	11.5	15.9	13.31	10
OCTOBER	5.5	15	10.72	31
NOVEMBER	5	8.6	6.79	30
DECEMBER	1.7	5.6	4.36	31

LITTLE QUALICUM RIVER 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.4	4.8	3.76	31
FEBRUARY	2	6.2	3.72	28
MARCH	2.9	7.2	4.93	31
APRIL	5.4	10.5	7.39	30
MAY	5.8	16.1	10.66	31
JUNE	11	17.7	13.73	17
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	7.5	14.1	10.68	28
NOVEMBER	.2	9.9	5.28	30
DECEMBER	.1	4.8	3.24	31

LITTLE QUALICUM RIVER 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.7	5.3	4.14	31
FEBRUARY	.7	5.6	3.36	28
MARCH	3.5	8.2	5.18	14
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

SWAMP 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	10.4	16	12.6	16
OCTOBER	8.2	12.6	10.29	31
NOVEMBER	6.3	11.4	9.23	13
DECEMBER		NO DATA		

SWAMP 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	4.3	8.7	6.47	13
FEBRUARY		NO DATA		
MARCH	4.3	6.6	5.45	1
APRIL		NO DATA		
MAY	7.4	11.9	10.03	29
JUNE	9.7	12.2	10.81	12
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	7.6	10.7	9.39	5
NOVEMBER	4.9	10.4	7.81	30
DECEMBER	2.9	7.1	4.53	31

SWAMP 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	1.2	5.3	3.46	31
FEBRUARY	2.2	6.4	4	28
MARCH	3.1	7.3	4.88	31
APRIL	4.9	10.3	7.1	30
MAY	7.1	14.9	10.29	31
JUNE	11.1	16	13.16	10
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	6.5	11	9.48	31
NOVEMBER	3.8	8.5	6	30
DECEMBER	3	7.7	4.59	31

SWAMP 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.4	6.3	4.89	31
FEBRUARY	3.6	9.6	5.54	28
MARCH	4.4	8.1	6.11	31
APRIL	6	12.7	7.97	30
MAY	8.2	13.3	10.53	31
JUNE	11.6	13.3	12.3	15
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	7	9.7	8.44	20
NOVEMBER	4	10.4	7.48	30
DECEMBER	2.6	5.3	4.24	24

SWAMP 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.3	6.1	3.94	29
FEBRUARY	3.6	5.9	4.66	27
MARCH	4.1	8.5	6.04	31
APRIL	4.8	9	7.51	30
MAY	7.9	10.7	9.03	31
JUNE	9.5	12.1	10.91	28
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	9.3	11.4	10.39	10
OCTOBER	5.3	11.6	8.78	31
NOVEMBER	4.1	6.9	5.63	30
DECEMBER	2.3	4.2	3.55	31

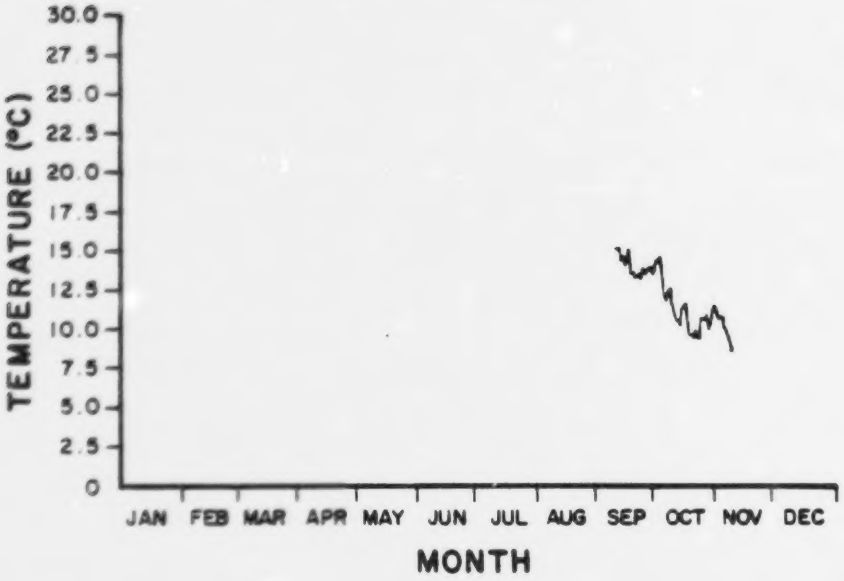
SWAMP 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.3	4.4	3.45	31
FEBRUARY	2.3	5.6	3.47	28
MARCH	3.2	9	4.56	30
APRIL	5.2	12.5	8.23	30
MAY	6.8	13.3	8.85	31
JUNE	9.5	10.6	10.08	17
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	7	9.7	8.74	28
NOVEMBER	3.2	7.7	5.08	30
DECEMBER	2.3	3.4	2.82	31

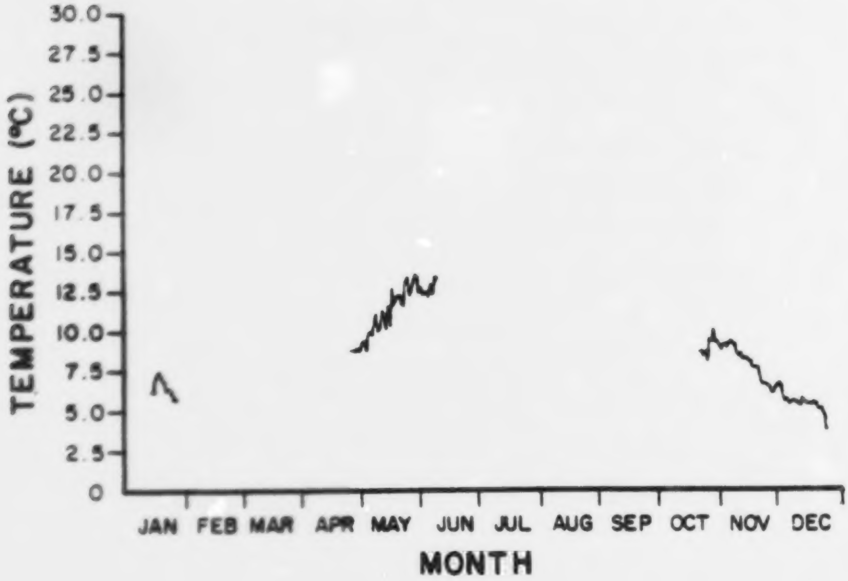
SWAMP 1986

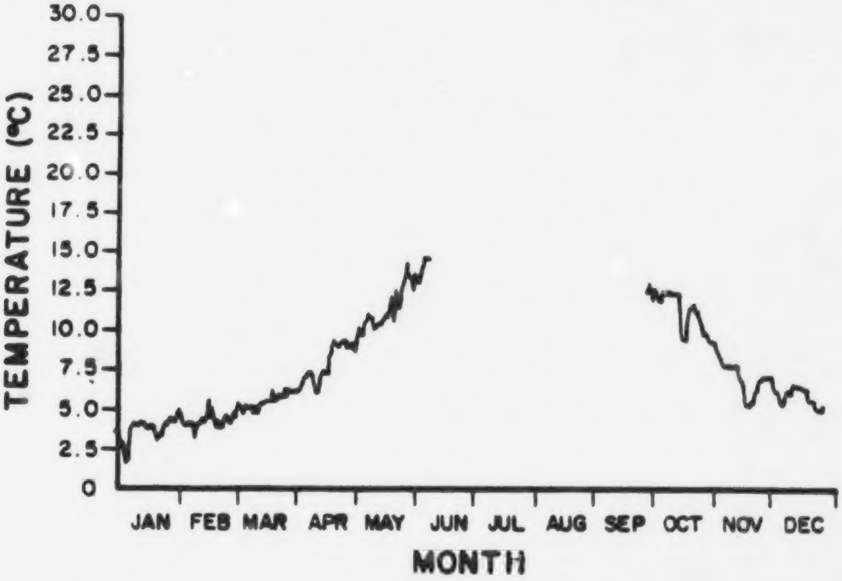
MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.1	4.8	3.57	31
FEBRUARY	-.1	5	2.49	28
MARCH	2.7	7.5	4.36	14
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

Little Qualicum River 1980

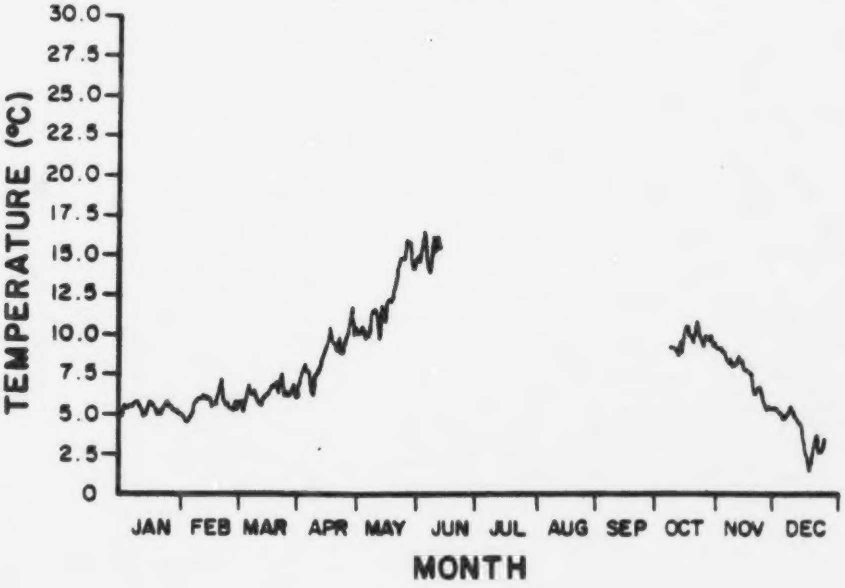


Little Qualicum River 1981



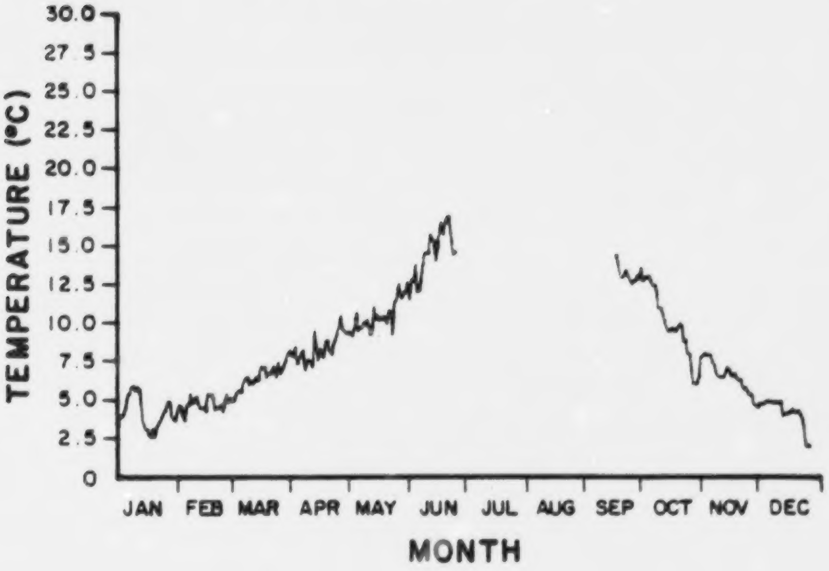


Little Qualicum River 1982

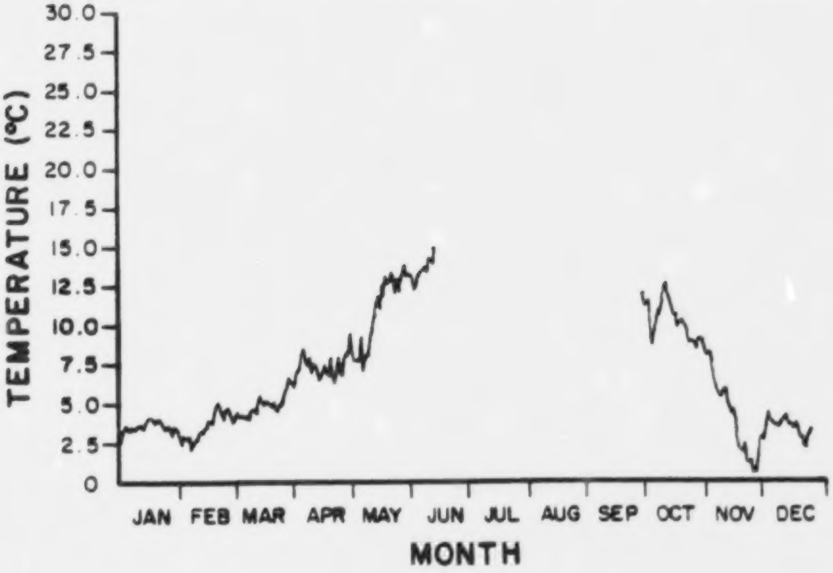


Little Qualicum River 1983

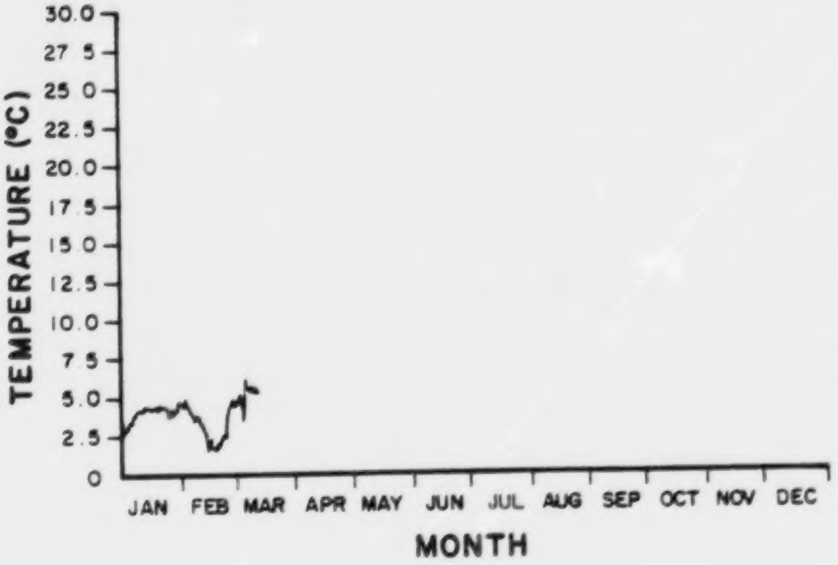
Little Qualicum River 1984



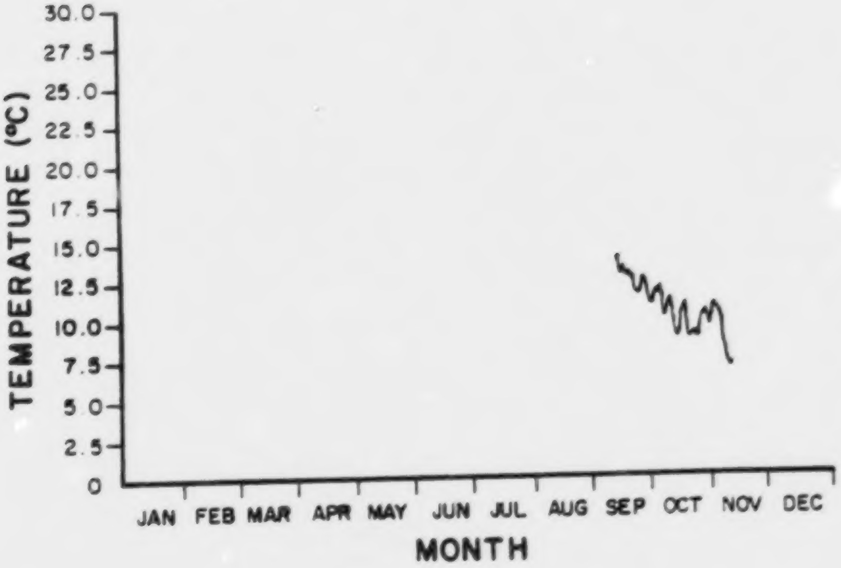
Little Qualicum River 1985



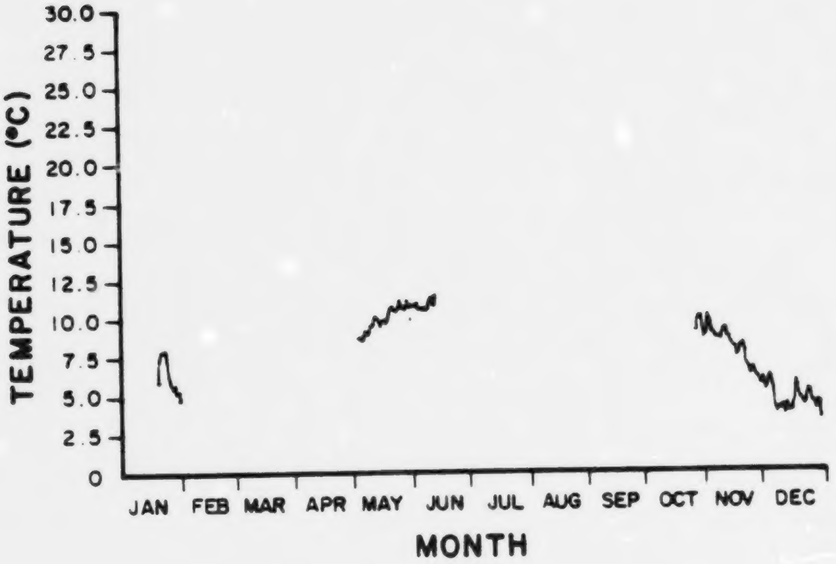
Little Qualicum River 1986



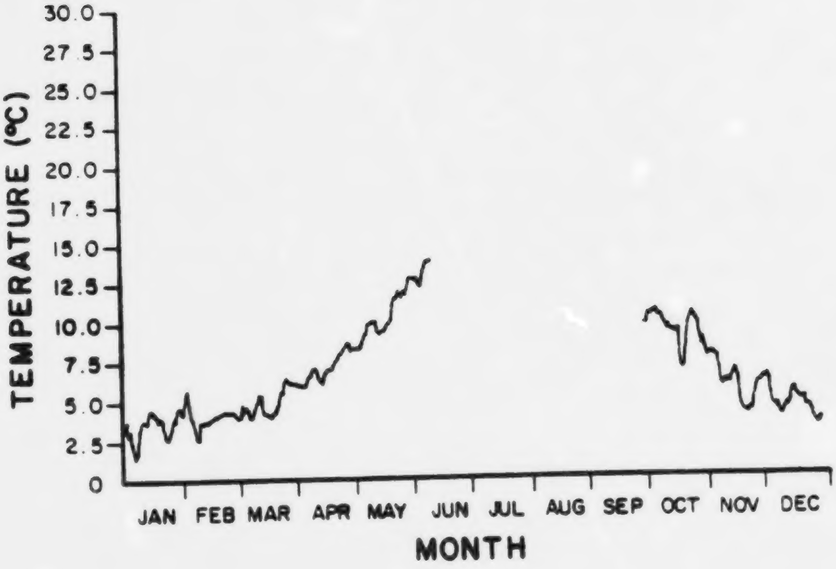
Swamp 1980

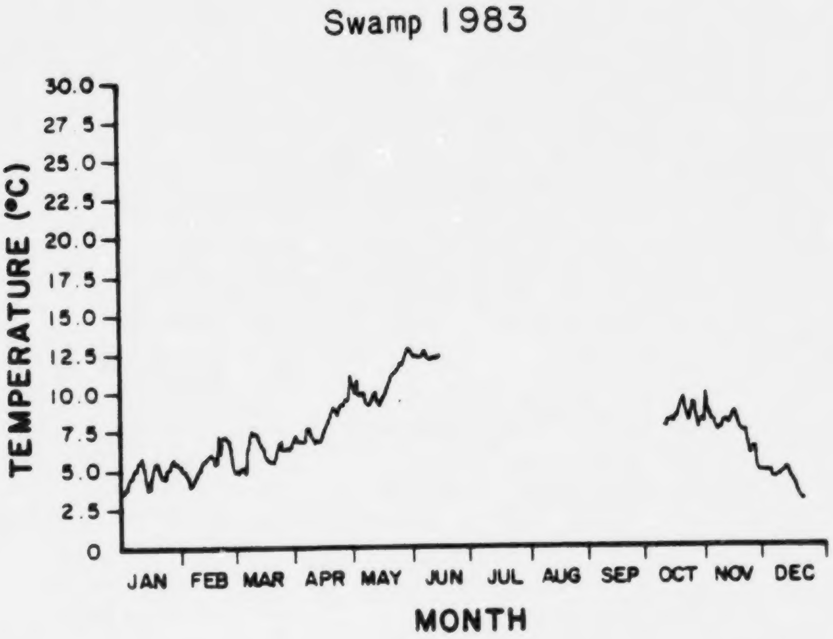


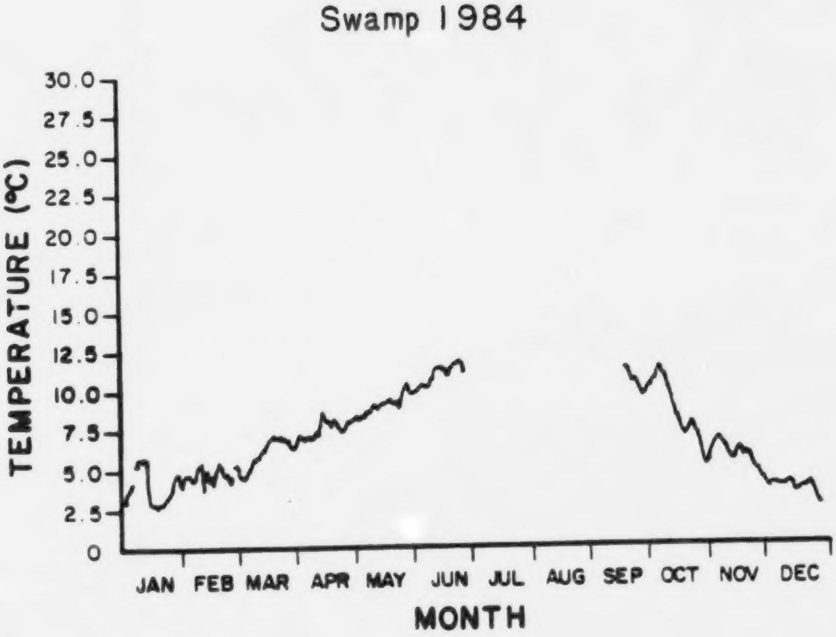
Swamp 1981



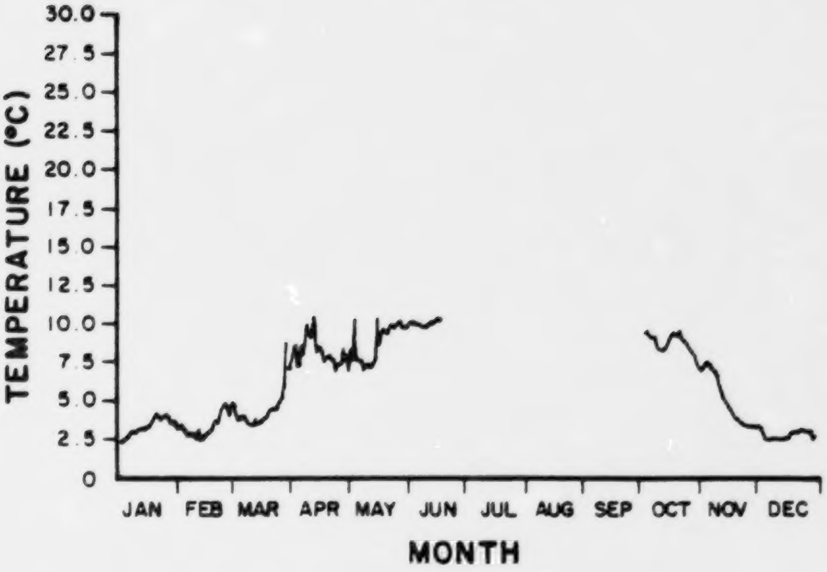
Swamp 1982



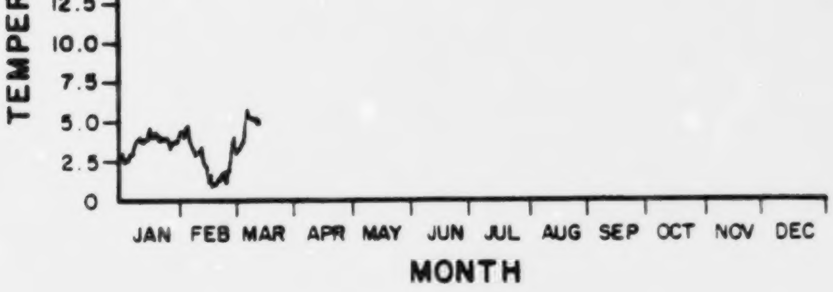

Swamp 1983


Swamp 1984

Swamp 1985



Swamp 1986



Volume

2

Water Quality and Temperature Data Collected Up to March, 1986 from Federal Salmonid Enhancement Facilities in British Columbia and the Yukon

Volume II

R.E. Miller, D.D. MacKinlay, C. Harlton,
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Vancouver, British Columbia V6B 5G3

May 1987

Canadian Data Report of
Fisheries and Aquatic Sciences
No. 643

Canadian Data Report of Fisheries and Aquatic Sciences

Data reports provide a medium for filing and archiving data compilations where little or no analysis is included. Such compilations commonly will have been prepared in support of other journal publications or reports. The subject matter of data reports reflects the broad interests and policies of the Department of Fisheries and Oceans, namely, fisheries and aquatic sciences.

Data reports are not intended for general distribution and the contents must not be referred to in other publications without prior written authorization from the issuing establishment. The correct citation appears above the abstract of each report. Data reports are abstracted in *Aquatic Sciences and Fisheries Abstracts* and indexed in the Department's annual index to scientific and technical publications.

Numbers 1-25 in this series were issued as Fisheries and Marine Service Data Records. Numbers 26-160 were issued as Department of Fisheries and the Environment, Fisheries and Marine Service Data Reports. The current series name was introduced with the publication of report number 161.

Data reports are produced regionally but are numbered nationally. Requests for individual reports will be filled by the issuing establishment listed on the front cover and title page. Out-of-stock reports will be supplied for a fee by commercial agents.

Rapport statistique canadien des sciences halieutiques et aquatiques

Les rapports statistiques servent à classer et à archiver les compilations de données pour lesquelles il y a peu ou point d'analyse. Ces compilations auront d'ordinaire été préparées à l'appui d'autres publications ou rapports. Les sujets des rapports statistiques reflètent la vaste gamme des intérêts et des politiques du ministère des Pêches et des Océans, c'est-à-dire les sciences halieutiques et aquatiques.

Les rapports statistiques ne sont pas destinés à une vaste distribution et leur contenu ne doit pas être mentionné dans une publication sans autorisation écrite préalable de l'établissement auteur. Le titre exact parait au-dessus du résumé de chaque rapport. Les rapports statistiques sont résumés dans la revue *Résumés des sciences aquatiques et halieutiques*, et ils sont classés dans l'index annuel des publications scientifiques et techniques du Ministère.

Les numéros 1 à 25 de cette série ont été publiés à titre de relevés statistiques, Services des pêches et de la mer. Les numéros 26 à 160 ont été publiés à titre de rapports statistiques du Service des pêches et de la mer, ministère des Pêches et de l'Environnement. Le nom actuel de la série a été établi lors de la parution du numéro 161.

Les rapports statistiques sont produits à l'échelon régional, mais numérotés à l'échelon national. Les demandes de rapports seront satisfaites par l'établissement auteur dont le nom figure sur la couverture et la page du titre. Les rapports épuisés seront fournis contre rétribution par des agents commerciaux.

Canadian Data Report of
Fisheries and Aquatic Sciences No. 643

May 1987

WATER QUALITY AND TEMPERATURE DATA COLLECTED UP TO MARCH, 1986 FROM FEDERAL SALMONID ENHANCEMENT FACILITIES IN BRITISH COLUMBIA AND THE YUKON

Volume II

R.E. Miller, D.D. MacKinlay, C. Harlton, P. O'Hearn
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ABSTRACT

R.E. Miller, D.D. MacKinlay, C. Harlton, P. O'Hearn and L. Chan. 1986. Water quality and temperature data collected to March, 1986 from federal salmonid enhancement facilities in British Columbia and the Yukon. Can. Data Rep. Fish. Aquat. Sci. 643: iv + 471 p. (2 vol.)

This report provides summary tables of water quality analyses and temperature monitoring from 27 major facilities of the Salmonid Enhancement Program in British Columbia and the Yukon.

RESUME

R.E. Miller, D.D. MacKinlay, C. Harlton, P. O'Hearn and L. Chan. 1986. Water quality and temperature data collected to March, 1986 from federal salmonid enhancement facilities in British Columbia and the Yukon. Can. Data Rep. Fish. Aquat. Sci. 643: iv + 471 p. (2 vol.)

On présente des tableaux sommaires des résultats de l'analyse de la qualité et de la température de l'eau obtenus de 27 facilités major du programme de mise en valeur des salmonides dans la région du Pacifique

Facility: MATHERS

Location:

Located 11 km south of Beatty Anchorage on Louise Island, in the Queen Charlotte Islands.

Description:

A pilot hatchery was constructed in 1980 to test the effects of marginally high ammonia levels in the well water. The facility has since been operated as a satellite of the Pallant Creek hatchery (see Fedorenko and Shepherd 1985 for details). The facility was built to offset increased fishing pressure by the commercial fleet on Cumshewa Inlet stocks.

The egg production target in 1985 was 2 M chum (egg incubation was at Pallant Creek in that year). Eggs are from Mathers Creek and juveniles are released back to the creek.

Water Sources:

Surface. A floating pump system supplies 3,390 lpm of water from a natural pool in Mathers Creek, immediately adjacent to the hatchery site.

Groundwater. Three wells were drilled and tested. One well is used for the hatchery, and supplies 1,320 lpm of water.

General Water Quality:

The water is marginally high in unionized ammonia, high in dissolved nitrogen and low in dissolved oxygen. An aeration tower is used to bring total dissolved gases to acceptable levels. Some temperature control can be acheived through mixing of well and creek water.

WATER QUALITY FOR MATHERS

(below detection limits = 0)

PARAMETERS	OCT 76/ NOV 77 MATHERS CREEK	JAN- DEC/78 MATHERS CREEK	JAN12/78 MATHERS CREEK	FEB8/78 MATHERS CREEK	APR14/78 MATHERS CREEK	APR20/78 MATHERS CREEK	MAY10/78 MATHERS CREEK	JUN8/78 MATHERS CREEK	JUL5/78 MATHERS CREEK	AUG2/78 MATHERS CREEK	SEP12/78 MATHERS CREEK
Alkalinity	17.5	11.3				13					
Ammonia						0					
CO2											
Chloride	4.2	4.3				5.4					
Color						25					
Conductivity Field											
Conductivity Lab	44	42				48.5					
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness		20.9		9.9	16.3	14.4	18.4		20.3	32.2	21.3
Nitrite	0	0	0	0	0	0	0	0	0	0	0
Nitrate	.79	.075	.095	.104	.076	.0858	.062	.043	.056	.076	.11
pH-Field											
pH-Lab	7	7				7.1					
Phosphate		0	0	0	0	0	0	0	0	0	.007
Residue Filterable	39	41	40	31	37		35	41	50.3	54	40
Residue Non-Filter		0	0	7	0	0	0	0	0	0	0
Silica		1.7	1.96	0	1.66	1.74	1.8	2	2.3	2.84	1.75
Sulphate		2.8	3	2.48		2.8	2.48	1.57	2.5	2.97	3
Taste											
Temperature											
Turbidity		1.7				0					
METALS—											
Al-Aluminum		0	0	0	0	0	0	0	0	0	0
As-Arsenic		0	0	0	0	0	0	0	0	0	0
Ba-Barium		.028	.0097	.008	.0073	.0044	.0083	.0823	.0069	.0373	.0405
Ca-Calcium		6.7	5.07	3.04	5.55	5.89	6.14	10.1	6.43	11	7.13
Cd-Cadmium		0	0	0	0	0	0	0	0	0	0
Co-Cobalt		0	0	0	0	0	0	0	0	0	0
Cr-Chromium		0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.35	.25	.244	.264	0	.175	.157	.231	.266	.42	.223
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K—Potassium		.21	.23								
Mg-Magnesium		.8	.8	.55	.59	.681	.744	.723	1.04	1.15	.848
Mn-Manganese		.02	.0129	.0175	.011	.0139	.0117	.0154	.0154	.025	.0147
Mo-Molybdenum		0	0	0	0	0	0	0	0	0	0
Na-Sodium		3.3	3.24	2.22	2.21	3.17	3.63	3.66	3.92	4.96	3.39
Ni-Nickle		0	0	0	0	0	0	0	0	0	0
P—Phosphorous											
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony		0	0	0	0	0	0	0	0	0	0
Se-Selenium		0	0	0	0	0	0	0	0	0	0
Si-Silicon		1.48	1.89		1.03	1.78	1.66	1.46			
Sn-Tin		0	0	0	0		0	0	0	0	0
Sr-Strontium		.018	.0188	.0135	.0125	.0179	.0184	.0213	.0264		.0181
Ti-Titanium		0	0	0	0	0	0	0	0	0	0
V—Vanadium		0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.02	.21	0	.028	.122	0	.072	.825	0	.271	.346

WATER QUALITY FOR MATHERS
(below detection limits = 0)

PARAMETERS	OCT8/78 MATHERS CREEK	OCT11/78 MATHERS CREEK	OCT13/78 MATHERS CREEK	DEC7/78 MATHERS CREEK	APR/79 MATHERS CREEK	JAN22/79 MATHERS CREEK	MAY/79 MATHERS CREEK	JULY6/79 MATHERS CREEK	SEP30/79 MATHERS CREEK	OCT18/79 MATHERS CREEK	NOV4/79 MATHERS CREEK
Alkalinity		11.3		11.3	4.08	4.08		16	10.8	8.8	12.7
Ammonia		.016	.36	.016	.0075	.0075		.0068	.0095	0	.011
CO2											
Chloride		4.28	12.5	4.28	4.75	4.75		4.68	5.09	5.27	8.33
Color										45	
Conductivity Field											
Conductivity Lab		41.8		41.8	37.4	37.4	45.9	53.8	47.8	42.6	63
Dissolved O2-ppm							12.9				
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	23.6	14.4	66	14.4	13.4	13.4		19.1	15.1	13.7	18.8
Nitrite	0	0	0	0	0	0		0	0	0	0
Nitrate	.062	.07	0	.07	.069	.069		.039	.168	.158	.135
pH-Field											
pH-Lab		7		7	6.6	6.6	6.3	7.2	6.6	6.5	6.8
Phosphate	.0155			.0075		.021		0	.008	.016	.005
Residue Filterable		40		40	40	40		42	52	40	48
Residue Non-Filter				5		21		0		0	0
Silica	2.1			.5		1.31		2.1	1.63	1.58	1.83
Sulphate	3.95			2.92		3.3		2.5	4.32	3.42	3.43
Taste											
Temperature							6				
Turbidity				1.7		4.7		0	1.2	2.1	1.1
METALS--											
Al-Aluminum	.39			.15		.39		0	.23	.25	.1
As-Arsenic	0			0		0		0	0	0	0
Ba-Barium	.0505			.006		.0088		.0232	.0085	.0077	.0087
Ca-Calcium	7.99			4.66		4.23		6.09	4.65	4.19	5.75
Cd-Cadmium	0			0		0		0	0	0	0
Co-Cobalt	0			0		0		0	0	0	0
Cr-Chromium	0			0		0		0	0	0	0
Cu-Copper	0	.01	0	.01	0	0		0	0	0	0
Fe-Iron	.453	241	.453	.241	.391	.391		.277	.358	.291	.203
Hg-Mercury	0	0	0	0	0	0		0	0	0	0
K--Potassium				.195		.216		.273	.269	.257	.301
Mg-Magnesium	.874			.673		.693		.952	.837	.782	1.08
Mn-Manganese	.0197			.0131		.0339		.018	.0251	.023	.019
Mo-Molybdenum	0			0		0		0	0	0	0
Na-Sodium	4.03			1.8		2.31		3.45	3.3	3.03	4.21
Ni-Nickle	0			0		0		0	0	0	0
P--Phosphorus				0		0		0	0	0	0
Pb-Lead	0	0	0	0	0	0		0	0	0	0
Sb-Antimony	0			0		0		0	0	0	0
Se-Selenium	0			0		0		0	0	0	0
Si-Silicon				1.35		1.64		2.03	1.85	1.67	1.98
Sn-Tin	0			0		0		0	0	0	0
Sr-Strontium	.0188			.016		.0153		.0218	.0186	.0158	.0237
Ti-Titanium	0			0		0		0	0	0	0
V--Vanadium	0			0		0		0	0	0	0
Zn-Zinc	.335	.129	.423	.129	.23	.23		.136	.0031	.0013	.001

WATER QUALITY VALUES FOR MATHERS CREEK
(below detection limits = 0)

PARAMETERS	AUG10/80 MATHERS CREEK	AUG12/80 MATHERS CREEK	APR12/82 MATHERS CREEK	FEB08/78 WELL #1	OCT13/78 WELL #1	MAY/79 WELL #1	AUG11/80 WELL #1	UNKNOWN WELL #1	OCT08/78 WELL #2	AUG10/80 WELL #3	AUG11/80 WELL #3
Alkalinity	132	8	16		127		130	134		132	130
Ammonia	.0615	.0082	.015		.38	.39	.0315	.37		.0615	.315
CO2											
Chloride	18.2	7	5.3	0	12.5		20	11.7	0	18.2	20
Color	5	4								5	4
Conductivity Field											
Conductivity Lab	325	78.8	58		287	228	318	284		325	318
Dissolved O2-ppm									.2	.3	.2
Dissolved O2-%sat									2	2.5	1.7
Dissolved Gas Tot									104	94.8	95.2
Dissolved Nitrogen									130	119.3	120
Hardness	70.9	20.8	18	82.9	68		20.8	66.4	82.8	70.9	73.3
Nitrite	0	.008	0	0	0		.007	.005	0	0	.007
Nitrate	.211	2.88	.09	0	0		.0107	.029	0	.21	.0107
pH-Field											
pH-Lab	8	8.3	7.4		8.1	7.35	8.1	8.3		8	8.1
Phosphate	0	.01112	.006		.0731				.145	0	.0058
Residue-Filterable	187		43		183		180	170		187	180
Residue-Nonfilterable	0		0		0					0	0
Silica	5.54	2.38	1.9		5.8				5.8	5.5	5.94
Sulphate	3.35	4.4	3.6		1.25				1.1	3.4	3
Taste											
Temperature			3.9			8			7.5	8.8	8.6
Turbidity	0	1.5	.1		0					0	0
METALS					OR 183?						
Al-Aluminum	0	0			0				0	0	0
As-Arsenic	0	0			0				0	0	0
Ba-Barium	.0179	.009			.0946				.0531	.0179	.0178
Ca-Calcium	17.5	6.59			15.7				17.8	17.5	17.7
Cd-Cadmium	0	0			0				0	0	0
Co-Cobalt	0	0			0				0	0	0
Cr-Chromium	0	0			0				0	0	.045
Cu-Copper	0	0		0	0		0	0	0	0	0
Fe-Iron	.031	.045		.037	.075		.314	.023	.037	.031	.034
Hg-Mercury	0	0		0	0		0	0	0	0	0
K--Potassium	2.8	.402			5.63					2.8	2.94
Mg-Magnesium	6.81	1.06			6.5				9.33	6.61	7.06
Mn-Manganese	.0633	.0242			.168				.158	.0827	.0827
Mo-Molybdenum	0	0			0				0	0	0
Na-Sodium	41.8	4.5			33.5				34.5	41.8	38
Ni-Nickel	0	0			0				0	0	0
P--Phosphorus	0	0			0					0	0
Pb-Lead	0	.019		0	0		.0012	0	0	0	.0012
Sb-Antimony	0	0			0				0	0	0
Se-Selenium	0	0			0				0	0	0
Si-Silicon	5.48	2.28			5.25					5.46	5.48
Sn-Tin	0	0			0				0	0	0
Sr-Strontium	.129	.0263			.123				.118	.131	.131
Ti-Titanium	0	0			0				0	0	0
V--Vanadium	0	0			0				0	0	0
Zn-Zinc	0	.0016		3.68	.423		.001	0	.368	0	0

WATER QUALITY VALUES FOR MATHERS CREEK
[below detection limits = 0]

PARAMETERS	AUG12/80 WELL #3	AUG13/80 08:00HRS WELL #3	AUG13/80 06:00HRS WELL #3
Alkalinity	116	130	130
Ammonia	.294	.326	.334
CO2			
Chloride	17.8	18	17.8
Color	15	4	4
Conductivity Field			
Conductivity Lab	305.5	308.7	309
Dissolved O2-ppm	.4	.3	.2
Dissolved O2-%sat	3.4	2.5	1.7
Dissolved Gas Tot	97.8	103.6	103.8
Dissolved Nitrogen	122.9	130.5	130.9
Hardness	72	71.3	73.1
Nitrite	.007	.006	.007
Nitrate	1.56	.0427	.0427
pH-Field			
pH-Lab	7.7	8.1	8.1
Phosphate	.0089	.0057	.006
Residue-Filterable	182	180	180
Residue-Nonfilterable	0	0	0
Silica	5.35	5.5	5.52
Sulphate	2.8	2.5	2.5
Taste			
Temperature	8.9	8.4	8.2
Turbidity	0	0	0
METALS			
Al-Aluminum	0	0	0
As-Arsenic	0	0	0
Ba-Barium	.0186	.0209	.018
Ca-Calcium	17.8	17.6	18
Cd-Cadmium	0	0	0
Co-Cobalt	0	0	0
Cr-Chromium	.015	.027	0
Cu-Copper	0	0	0
Fe-Iron	.045	.024	.018
Hg-Mercury	0	0	.00182
K--Potassium	2.79	2.53	2.53
Mg-Magnesium	6.7	6.65	6.83
Mn-Manganese	.0637	.0628	.0647
Mo-Molybdenum	0	0	0
Na-Sodium	35.4	35.4	35.4
Ni-Nickel	0	0	0
P--Phosphorus	0	0	0
Pb-Lead	.0067	.0143	0
Sb-Antimony	0	0	0
Se-Selenium	0	0	0
Si-Silicon	5.8	5.48	5.7
Sn-Tin	0	0	0
Sr-Strontium	.131	.128	.132
Ti-Titanium	0	0	0
V--Vanadium	0	0	0
Zn-Zinc	0	0	.00182

MATHERS CREEK 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH	-	-	4.98	31
APRIL	-	-	5.83	24
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

MATHERS CREEK 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	-	-	12.09	19
OCTOBER	-	-	9.9	31
NOVEMBER	-	-	6.02	30
DECEMBER	-	-	4.51	31

MATHERS CREEK 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	4.52	31
FEBRUARY	-	-	5.03	28
MARCH	-	-	4.92	31
APRIL	-	-	8.25	30
MAY	-	-	9.8	15
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	-	-	11.89	9
OCTOBER	-	-	9.78	9
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

MATHERS CREEK 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	-	-	11.36	11
OCTOBER	-	-	8.79	31
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

MATHERS CREEK 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL	-	-	7	12
MAY	-	-	8.1	31
JUNE	-	-	10.75	4
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

WELL 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH	-	-	7.5	31
APRIL	-	-	7.65	24
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

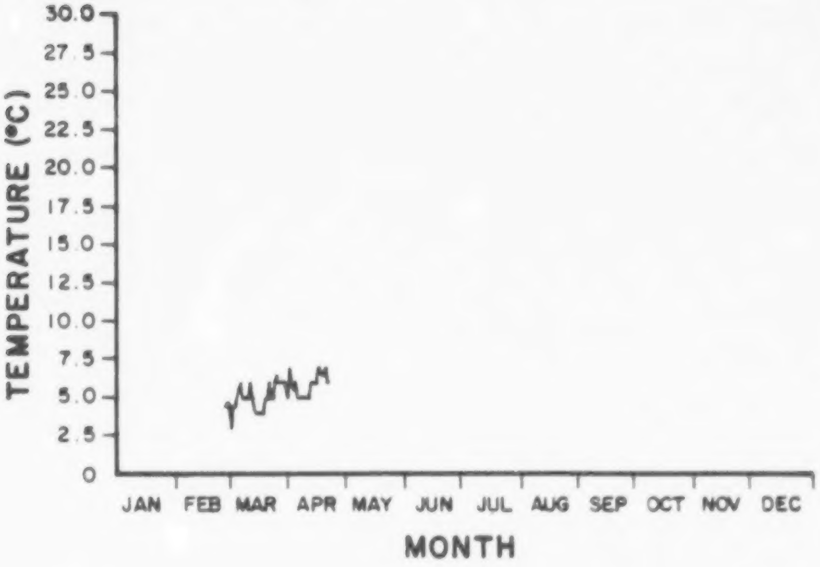
WELL 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER	-	-	7.6	3
DECEMBER	-	-	7.54	31

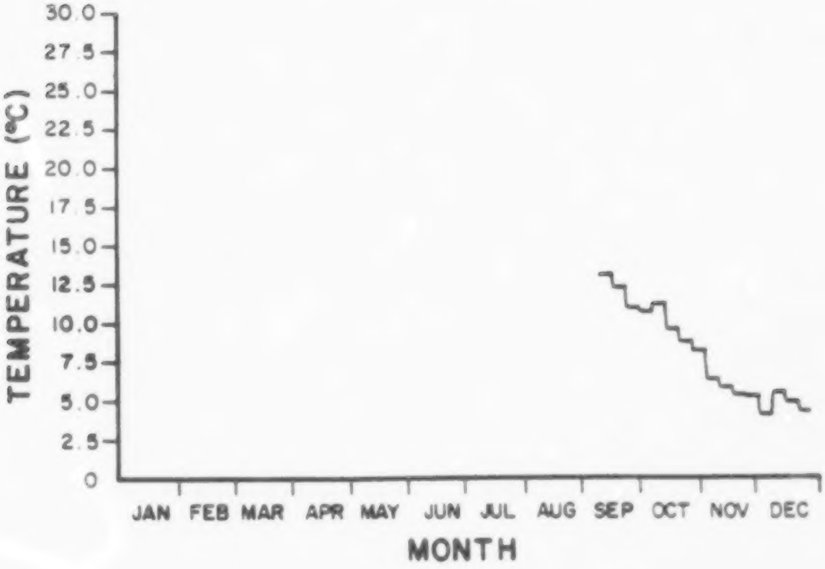
WELL 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	7.8	31
FEBRUARY	-	-	7.99	28
MARCH	-	-	7.77	31
APRIL	-	-	7.98	30
MAY	-	-	8.1	15
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	-	-	12	9
OCTOBER	-	-	9.9	10
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

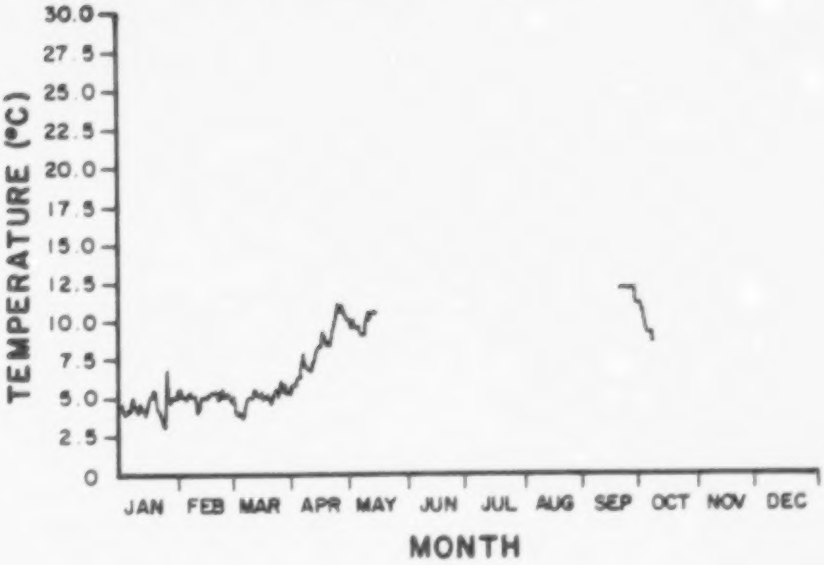
Mathers Creek 1981



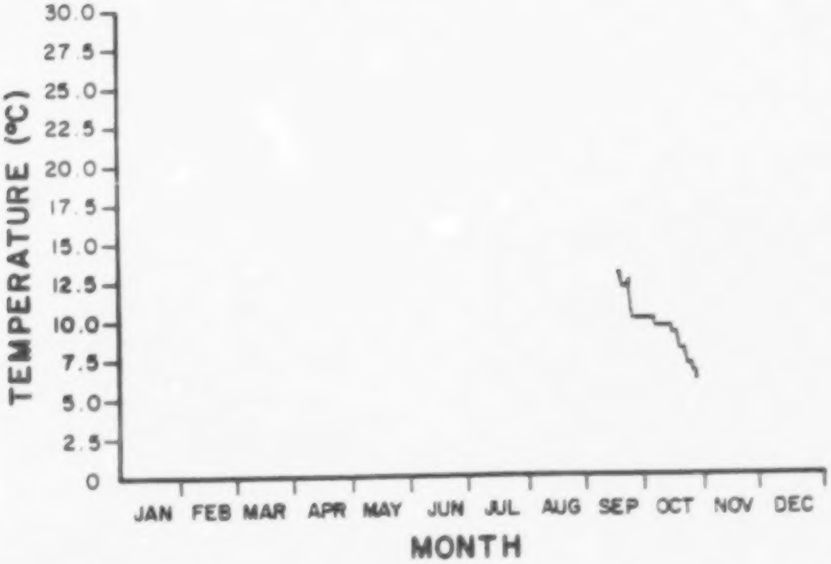
Mathers Creek 1982



Mathers Creek 1983



Mathers Creek 1985



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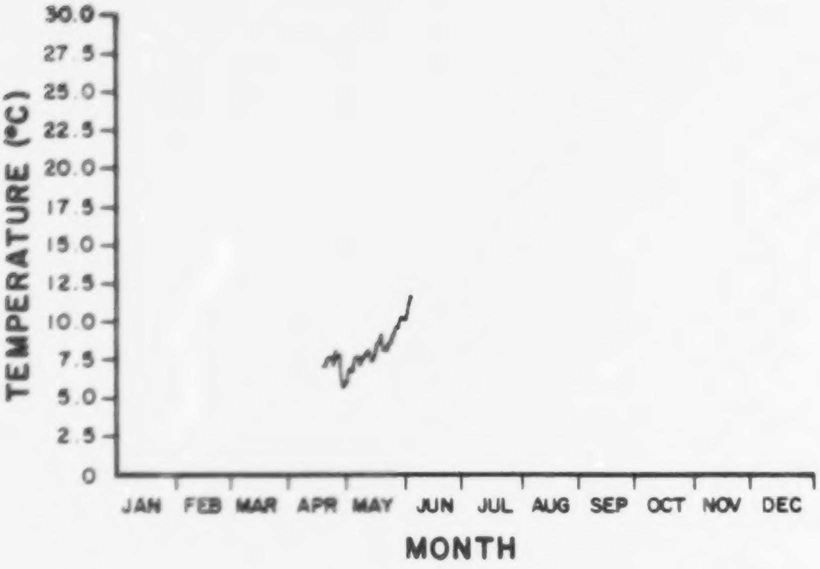
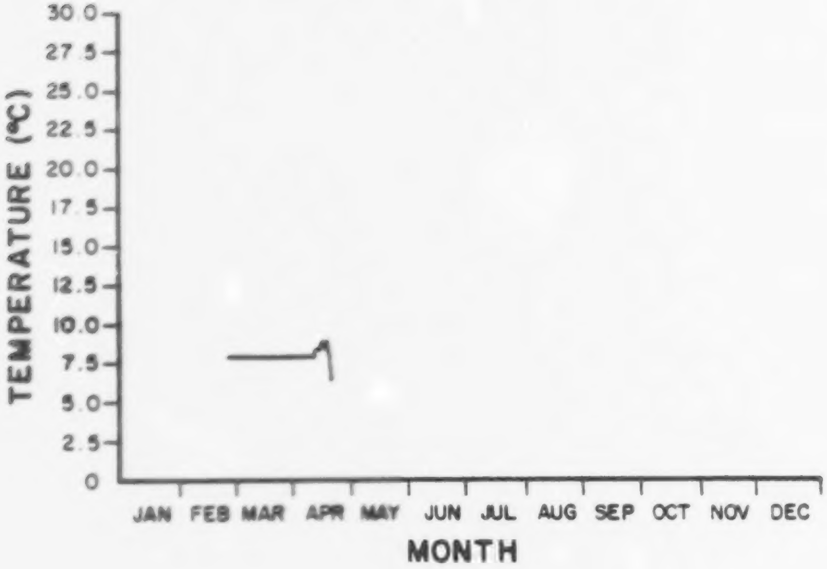
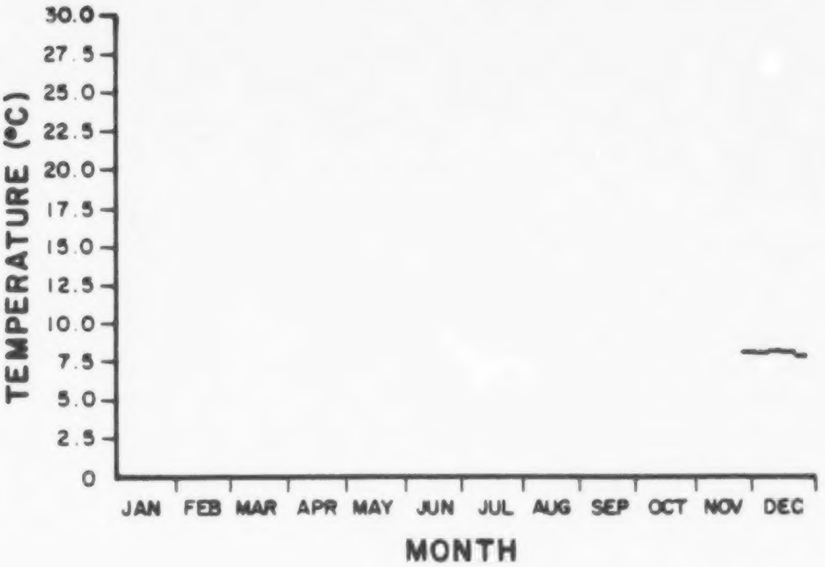


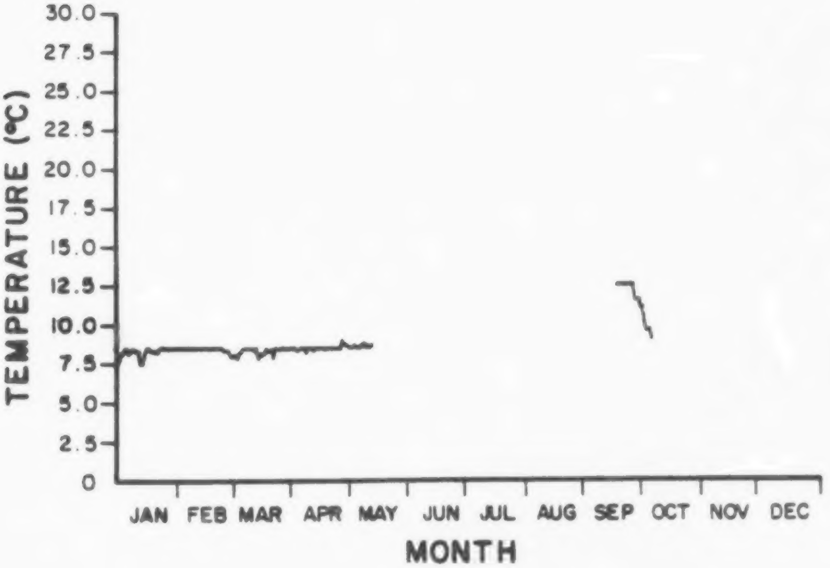
Well 1981



Well 1982



Well 1983



Facility: NITINAT

Location:

Located at the confluence of the Nitinat and Little Nitinat Rivers, approximately 60 km southwest of Port Alberni on the west coast of Vancouver Island.

Description:

This Japanese-style hatchery was built during 1979 to 1981, and was first in production in 1980. The facility was built to offset poor spawning survival caused by flash flooding.

Egg targets in 1985 were 100 M coho, 103 M chinook and 28 M chum. Eggs are obtained from the Nitinat and Sarita systems. Juveniles are released back into their streams of origin. Coho are released into tributaries of the Nitinat River as well.

Water Sources:

Surface. Surface water is pumped from the Nitinat River.

Groundwater. Six wells (well OW#1, DH#1, DH#2, DH#3, DH#4, and DH#5) are currently in use.

General Water Quality:

The river water is slightly alkaline, while the groundwater is slightly acid. River water can get dirty during floods. Well water is of good quality. Water temperature is controlled by mixing water sources.

Special Notes:

Daily well temperatures are not kept at the hatchery, however, well temperatures are recorded on an intermittant basis. Water quality samples of Nitinat River water have been taken at two sites. Prepump and postpump refer to water being drawn from the intake pipe before the water runs through the pump and after the water has run through the pump, respectively.

WATER QUALITY VALUES FOR NITINAT RIVER
(below detection limits = 0)

PARAMETERS	JUN03/78 RIVER INTAKE PREPUMP	MAR26/80 INTAKE PREPUMP	APR26/80 INTAKE PREPUMP	MAY27/80 INTAKE PREPUMP	JUN03/80 INTAKE PREPUMP	JUN24/80 INTAKE PREPUMP	NOV08/82 INTAKE PREPUMP	NOV24/82 INTAKE PREPUMP	JAN12/83 INTAKE PREPUMP	APR07/83 INTAKE PREPUMP	JUN01/83 INTAKE PREPUMP
Alkalinity	30.1	28.2	29.3	30.5	32.3	36			20	29	29
Ammonia	0	0	.005	0	0	0			.006	0	.006
CO2											
Chloride	1.1	1.54	1.38	1.59	1.39	1.97			1.7	1.8	1.4
Color											
Conductivity Field											
Conductivity Lab	67.5	68.5	70.5	74	73.5	83.5			46.2	64.5	64.2
Dissolved O2-ppm											
Dissolved O2-%sat							94.8		100.79	104.09	97.56
Dissolved Gas Tot							95.64	100.7	107.06	102.64	102.41
Dissolved Nitrogen							95.9		108.77	102.31	103.75
Hardness	30.9	31	34.1	36.2	34.9	37.7	29.2		22.4	27.8	28.5
Nitrite	0	.0073	.0056	0	0	0			0	0	0
Nitrate	.014	.0535	.13	.177	.0184	.0258			.08	.02	0
pH-Field	7.7	7.4	7.4	7.8		7.8	7.2		6.82	7.11	7.13
pH-Lab											
Phosphate	0	.0058	0	.0058	0	0			.015	0	0
Residue-Filterable	41	46	58	48	48	48			40	43	40
Residue-Nonfilterable	0	7	0	0		0			8	0	0
Silica	1.3	1.72	1.72	1.38	1.67	1.92			1.6	1.8	1.5
Sulphate	1.6	1.9	3.3	3	2.8	3.06			2.2	3.3	3.6
Taste											
Temperature	15	0	0	0	0	0	5.8	4	5.8	8.8	11.7
Turbidity											
METALS											
Al-Aluminum	0	0	0	0	.01	0	0		.22	.018	0
As-Arsenic											
Ba-Barium											
Ca-Calcium	11.2	11.1	12.3	13.2	1.37	13.6	10.2		7.2	1.9	10.1
Cd-Cadmium	0	0	0	0	0	0	0			0	0
Co-Cobalt											
Cr-Chromium											
Cu-Copper	0	0	0	0	0	0	0		0	0	.003
Fe-Iron	.035	.037	.025	.01	.782	.015	.027		.144	.7	.018
Hg-Mercury	0	0	0	0	0	0	0		0		0
K—Potassium	.117	.123	.158	.131		.13			.27	0	.498
Mg-Magnesium	.7	.806	.81	.782		.901	.8		.7	.004	.8
Mn-Manganese	.0033	.0038	0	0	12.7	0	.005		0	9.8	.023
Mo-Molybdenum											
Na-Sodium	.57	1.18	1.15	1.28	.12	1.4	2.8		2	.15	1.8
Ni-Nickel											
P—Phosphorus											
Pb-Lead	0	0	0	0		0	0		0	0	.002
Sb-Antimony											
Se-Selenium											
Si-Silicon											
Sn-Tin											
Sr-Strontium											
Ti-Titanium											
V—Vanadium											
Zn-Zinc	0	0	.002	.0014	0	0	.003		.003	0	.032

WATER QUALITY VALUES FOR NITINAT RIVER
(below detection limits = 0)

PARAMETERS	DEC01/83 RIVER INTAKE PREPUMP	JAN19/84 INTAKE PREPUMP	OCT23/85 INTAKE PREPUMP	NOV09/82 INTAKE POSTPUMP	NOV24/82 INTAKE POSTPUMP	JAN12/83 INTAKE POSTPUMP	JUN01/83 INTAKE POSTPUMP	DEC01/83 INTAKE POSTPUMP	JAN19/84 INTAKE POSTPUMP	JUN01/83 WELL OW-1	FEB19/85 WELL OW-1
Alkalinity		29	25.1							17.5	19.8
Ammonia		0	.025							0	0
CO2											
Chloride		1.8	2.1							1.6	1.8
Color											
Conductivity Field											
Conductivity Lab		74	63							43.8	50
Dissolved O2-ppm											
Dissolved O2-%sat	102.37	96.03	93.41	96.81		102	101.74	98	96.66	91.51	87.58
Dissolved Gas Tot	102.92	100.16	101.32	95.64	101.8	108.39	103.62	102.78	100.03	103.21	109.09
Dissolved Nitrogen	103.11	101.3	103.47	95.37		110.13	104.17	104.1	100.97	108.98	114.84
Hardness	31	34.4	23.4	30.2		22.2	28.2		34.2	14.9	21
Nitrite		0	0							0	0
Nitrate		.09	.076							.03	.09
pH-Field	7.17		7.2	7.22		6.88	7.39	6.98		6.13	6.4
pH-Lab										6.5	6.4
Phosphate		.004	.014							0	.003
Residue-Filterable		50	45							35	36
Residue-Nonfilterable		0	0							0	0
Silica		2	2.7							3.2	.6
Sulphate		3	3							2.4	2
Taste											
Temperature	4.4	2.9	8.3	5.8	4.4	5.8	12.3	4.4	3	8.8	7.4
Turbidity										0	0
METALS											
Al-Aluminum	0	0	0	0		.19	0		0	0	0
As-Arsenic										0	0
Ba-Barium										.005	.006
Ca-Calcium	10.9	12.2	8	10.6		7.3	10		12.1	5.1	7.3
Cd-Cadmium	0	0	0	0			0		0	0	0
Co-Cobalt										0	0
Cr-Chromium										0	0
Cu-Copper	0	0	.001	0		0	0		0	0	.002
Fe-Iron	.03	.023	0	.037		.131	.014		.021	0	0
Hg-Mercury			.00013	0		0	0			0	0
K--Potassium	.21	.163	.21			.2	.129		.256	.193	.16
Mg-Magnesium	.9	.9	.8	.8		.7	.9		.9	.5	.7
Mn-Manganese	.014	.006	.005	.007		0	.006		.007	.003	.008
Mo-Molybdenum										0	0
Na-Sodium	2.1	2.2	2.5	2.5		1.9	1.5		2.1	1.8	2.3
Ni-Nickel										0	0
P--Phosphorus										0	0
Pb-Lead	0	0	0	0		0	0		0	0	0
Sb-Antimony										0	0
Se-Selenium										0	0
Si-Silicon										2.9	.6
Sn-Tin										0	0
Sr-Strontium										.013	.017
Ti-Titanium										0	0
V--Vanadium										0	0
Zn-Zinc	0	0	0	.011		.008	0		0	0	0

WATER QUALITY VALUES FOR NITINAT
(below detection limits = 0)

PARAMETERS	OCT23/85 WELL OW-1 14:16 HR	JUN01/83 WELL DH-1	FEB19/85 WELL DH-1	APR07/83 WELL DH-2	FEB19/85 WELL DH-2	NOV03/81 WELL DH-3	NOV09/82 WELL DH-3	JAN11/83 WELL DH-3	APR07/83 WELL DH-3	DEC01/83 WELL DH-3	JUN13/79 WELL DH-4
Alkalinity	21.2	17	18.7	24.5	25				34		27.4
Ammonia	0	0	0	0	0				0		0
CO2											
Chloride	2.4	1.9	1.9	2.8	2.3				2.5		1.64
Color											
Conductivity Field											
Conductivity Lab	58	43.8	50	64.2	70				77.3		64.5
Dissolved O2-ppm											
Dissolved O2-%sat	66.6	83.77	82.32	72.73	68.34	77	69.45	75.24	82.23	75.43	88
Dissolved Gas Tot	104.12	100.4	105.8	100.79	102.11	109.1	0	107.94	100.26	105.18	104.4
Dissolved Nitrogen	114.11	104.86	112.07	108.28	111.11	117.65	0	116.88	105.09	113.11	107.8
Hardness	23.4	15.3	20.1	24.7	28	40.2	32.7	33.3	30.9	33.6	26.2
Nitrite	0	0	0	0	0				0		0
Nitrate	.113	.04	.21	.17	.18				.09		.041
pH-Field	6.3	8.17	8.4	6.19	6.3	8.8	8.44	8.38	6.45	6.24	6.8
pH-Lab	6.3		8.4	6.5	6.3				6.6		
Phosphate	.004	0	.002	0	0				0		.006
Residue-Filterable	39	30	32	44	48				58		47
Residue-Nonfilterable	0	7	0	0	0				0		0
Silica	2.7	3.1	.6	4	.8				5.3		4.55
Sulphate	3	2.7	3	3.6	3				2.7		0
Taste											
Temperature	10.1	8.4	7	8.5	8.5	9.3	8.75	8.4	8.8	9.1	8
Turbidity				.1					.1		
METALS											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0		0	0	0	0	
Ba-Barium	.013	.004	.005	.001	.006		.005	.006	.004	.006	
Ca-Calcium	8	5.1	7	8.3	9.6	14.1	11.3	11.5	10.8	11.9	9.09
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0		0	0	0	0	
Cr-Chromium	0	0	0	0	0		.006	0	0	0	
Cu-Copper	0	0	.008	0	0	.0015	.0017	.002	0	.001	0
Fe-Iron	0	.008	.005	0	.007	0	0	0	.03	0	0
Hg-Mercury	.00013	0	0			0	0	0			0
K--Potassium	.23	.219	.18	.28	.22	.228		.29	.27	.245	.224
Mg-Magnesium	.8	.6	.7	1	1	1	1	1	1	1	.847
Mn-Manganese	.005	.006	.008	.006	.007	.001	.001	0	.002	.009	0
Mo-Molybdenum	0	0	0	0	0		0	0	0	0	
Na-Sodium	2.5	2.3	2.1	3.2	2.8	2.51	3.4	3	2.9	3.1	1.18
Ni-Nickel	0	0	0	0	0		0	0	0	0	
P--Phosphorus	0	0	0	0	0		0	0	0	0	
Pb-Lead	0	.002	0	0	0	0	0	.001	0	0	0
Sb-Antimony	0	0	0	0	0		0	0	0	0	
Se-Selenium	0	0	0	0	0		0	0	0	0	
Si-Silicon	2.7	2.8	.6	3.7	.8		4.9	5	4.9	5.4	
Sn-Tin	.02	0	0	.01	0		.01	0	.01	0	
Sr-Strontium	.08	.013	.017	.021	.022		.028	.03	.027	.029	
Ti-Titanium	0	0	0	0	0		0	0	0	0	
V--Vanadium	0	0	0	0	0		0	0	0	0	
Zn-Zinc	0	.003	.003	0	0	.0017	0	.004	0	0	0

WATER QUALITY VALUES FOR NITINAT
(below detection limits = 0)

PARAMETERS	NOV03/81 WELL DH-4	APR07/83 WELL DH-4	JUN01/83 WELL DH-4	DEC01/83 WELL DH-4	JUN06/79 WELL DH-5	JUN08/79 WELL DH-5	FEB13/81 WELL DH-6	MAR13/81 WELL DH-6	NOV03/81 WELL DH-5	NOV08/82 WELL DH-6	JAN11/83 WELL DH-6
Alkalinity	32.1	20	18								
Ammonia	0	0	0								
CO2											
Chloride	3.51	2.1	1.8								
Color											
Conductivity Field											
Conductivity Lab	80.3	50.2	48.8								
Dissolved O2-ppm											
Dissolved O2-%sat	54.3	81.28	79.32	88.54		81			61.5	66.3	69.44
Dissolved Gas Tot	108.8	101.32	103.48	105.85		101.6			109.09	0	110.86
Dissolved Nitrogen	123.03	106.68	109.93	115.76		106			121.75	0	121.88
Hardness	31.6	19.6	16.4	24.5	24.18	23.7	27	28.2	27.6	22.4	25.3
Nitrite	0	0	0								
Nitrate	.154	.1	.07								
pH-Field	6.4	6.5	7.39	6.07						6.24	6.53
pH-Lab		6.5	7.1								
Phosphate	0	0	0								
Residue-Filterable	61	37	40								
Residue-Nonfilterable	0	0	0								
Silica		4.1	3.8								
Sulphate	2.2	2.8	3.9								
Taste											
Temperature	9.7	8.3	8.1	10.2		8.8			10	8.75	9
Turbidity		.1	0								
METALS											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic		0	0	0		0				0	0
Ba-Barium		.001	.004	.007		.0042				.006	.007
Ca-Calcium	11	8.8	5.8	8.4	8.41	8.23	9.24	9.88	9.54	7.8	8.8
Cd-Cadmium	0	0	0	0		0	.0022	0	0	0	0
Co-Cobalt		0	0	0		0				0	0
Cr-Chromium		0	0	0		0				0	0
Cu-Copper	0	.001	0	.001	0	0	0	.001	0	0	0
Fe-Iron	.0052	.01	.047	.008	0	0	0	0	0	.078	0
Hg-Mercury	0		0		0	0	0	0	0	0	0
K--Potassium	.245	.21	.233	.303	.19	.188	.233		.197		.24
Mg-Magnesium	1.03	.7	.8	.9	.773	.777	.948	.89	.9	.8	.9
Mn-Manganese	.0012	.001	.003	.009	0	0	.0064	.0038	.0048	.004	0
Mo-Molybdenum		0	0	0		0				0	0
Na-Sodium	2.41	2.4	1.8	2.8	1.16	1.09	2.41	2.4	2.12	2.9	2.6
Ni-Nickel		0	0	0		0				0	0
P--Phosphorus		0	0	0		0				0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony		0	0	0		0				0	0
Se-Selenium		0	0	0		0				0	0
Si-Silicon		3.7	3.6	4.2		4.14				3.3	3.5
Sn-Tin		0	0	0		0				0	0
Sr-Strontium		.018	.013	.023		.0208				.02	.027
Ti-Titanium		0	0	0		0				0	0
V--Vanadium		0	0	0		0				0	0
Zn-Zinc	.0011	0	0	.002	0	0	.0014	.0018	.0037	.006	0

WATER QUALITY VALUES FOR NITINAT
(below detection limits = 0)

PARAMETERS	APR07/83 WELL DH-5	JUN01/83 WELL DH-5	DEC01/83 WELL DH-5	JAN19/84 WELL DH-5
Alkalinity	18.5	19		16
Ammonia	0	0		0
CO2				
Chloride	2	2		2.2
Color				
Conductivity Field				
Conductivity Lab	48.9	45.3		48.8
Dissolved O2-ppm				
Dissolved O2-%sat	88.73	83.75	80.92	82.71
Dissolved Gas Tot	101.59	102.01	106.91	108.72
Dissolved Nitrogen	105.04	106.89	113.84	113.13
Hardness	17.5	18.4	19.1	20
Nitrite	0	0		0
Nitrate	.06	.03		.14
pH-Field	6.13	6.22	6.33	
pH-Lab	6.6	6.7		6.1
Phosphate	0	.008		.006
Residue-Filterable	34	35		45
Residue-Nonfilterable	0	0		0
Silica	3.1	3.2		3.2
Sulphate	3.1	2.6		2.2
Taste				
Temperature	7.2	8.6	9.7	7.8
Turbidity	.1	0		0
METALS				
Al-Aluminum	0	0	0	0
As-Arsenic	0	0	0	0
Ba-Barium	.008	.004	.009	.006
Ca-Calcium	6	5.6	6.5	6.8
Cd-Cadmium	0	0	0	0
Co-Cobalt	0	0	0	0
Cr-Chromium	0	0	0	0
Cu-Copper	0	0	.003	0
Fe-Iron	0	0	0	.023
Hg-Mercury		0		
K--Potassium	.18	.219	.21	.209
Mg-Magnesium	.6	.6	.6	.7
Mn-Manganese	.002	.006	.007	.007
Mo-Molybdenum	0	0	0	0
Na-Sodium	2.3	2	2.2	2.6
Ni-Nickel	0	0	0	0
P--Phosphorus	0	0	0	0
Pb-Lead	0	0	0	0
Sb-Antimony	0	0	0	0
Se-Selenium	0	0	0	0
Si-Silicon	2.8	2.9	3.1	3.2
Sn-Tin	0	0	0	0
Sr-Strontium	.015	.013	.016	.017
Ti-Titanium	0	0	0	0
V--Vanadium	0	0	0	0
Zn-Zinc	0	.006	.002	0

NITINAT RIVER 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	8.7	9.7	9.73	21
NOVEMBER	6	10.7	8.25	30
DECEMBER	3.8	8.9	6.66	31

NITINAT RIVER 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	5	9	6.95	31
FEBRUARY	5	8	6.56	28
MARCH	5.5	10	7.89	31
APRIL	4.5	9	7.37	30
MAY	7	13.5	9.94	31
JUNE	9.5	14.5	11.12	30
JULY	12	19.5	14.79	31
AUGUST	14	21.5	17.52	31
SEPTEMBER	9.5	18	13.87	30
OCTOBER	7	11.5	9.16	31
NOVEMBER	5.3	10.5	8.22	30
DECEMBER	3.3	7.5	5.56	31

NITINAT RIVER 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	1.5	5.4	3.89	31
FEBRUARY	3.1	5.7	4.47	28
MARCH	4.2	7.4	5.51	31
APRIL	4	9.2	6.51	30
MAY	6	11.4	8.91	31
JUNE	8.3	16.2	12.46	30
JULY	11.6	19.3	14.45	31
AUGUST	13.6	19.6	15.64	31
SEPTEMBER	10.4	19	14.13	30
OCTOBER	7.2	12	9.95	31
NOVEMBER	4.4	9	6.61	30
DECEMBER	3.6	7.4	5.75	31

NITINAT RIVER 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	4.2	7	5.97	31
FEBRUARY	4.8	7.8	6.29	28
MARCH	5.28	8.89	6.82	31
APRIL	5.83	12.22	8.49	30
MAY	7.78	15.83	11.57	31
JUNE	10	16.67	12.34	30
JULY	10.56	16.11	12.98	31
AUGUST	13.61	18.06	16.14	31
SEPTEMBER	9.2	16.11	12.91	30
OCTOBER	7.8	11.8	9.75	31
NOVEMBER	4.8	9.2	7.54	30
DECEMBER	.4	5.8	3.72	31

NITINAT RIVER 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.2	6.4	4.54	31
FEBRUARY	4.3	6.5	5.36	28
MARCH	4.5	8.4	6.29	31
APRIL	5.3	10	6.99	30
MAY	6.7	11.7	8.35	31
JUNE	8.6	15	11.45	30
JULY	10	18.5	14.65	31
AUGUST	13	18	15.88	31
SEPTEMBER	9.5	15	12.25	30
OCTOBER	5.4	12	8.77	31
NOVEMBER	4.4	8.8	6.13	30
DECEMBER	1.8	5.3	3.94	31

NITINAT RIVER 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	1.4	5.6	3.78	31
FEBRUARY	1	6.7	4.05	28
MARCH	2.7	7.2	4.96	31
APRIL	4.7	8.4	6.66	30
MAY	6.5	12.7	9.24	31
JUNE	9.8	18	12.83	30
JULY	12	21	17.34	31
AUGUST	14	19.5	16.27	31
SEPTEMBER	9.5	17	13.43	30
OCTOBER	7	14	9.88	30
NOVEMBER	-.5	8.3	4.2	30
DECEMBER	0	5.5	3.52	31

WELL DH-3 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	8.8	2
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL	-	-	8.6	4
MAY	-	-	8.58	5
JUNE	-	-	8.65	4
JULY	-	-	8.6	1
AUGUST	-	-	8.8	1
SEPTEMBER		NO DATA		
OCTOBER	-	-	8.9	2
NOVEMBER	-	-	8.9	3
DECEMBER	-	-	9.27	3

WELL DH-4 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	-	-	9.22	3
NOVEMBER	-	-	10	1
DECEMBER	-	-	9.98	5

WELL DH-4 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	9.5	3
FEBRUARY	-	-	9.1	3
MARCH	-	-	8.8	4
APRIL	-	-	8.05	4
MAY	-	-	7.6	1
JUNE		NO DATA		
JULY		NO DATA		
AUGUST	-	-	7.4	1
SEPTEMBER		NO DATA		
OCTOBER	-	-	9	3
NOVEMBER	-	-	9.7	3
DECEMBER		NO DATA		

WELL DH-5 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	-	-	11	3
NOVEMBER	-	-	10	1
DECEMBER	-	-	9.04	5

WELL DH-5 1984

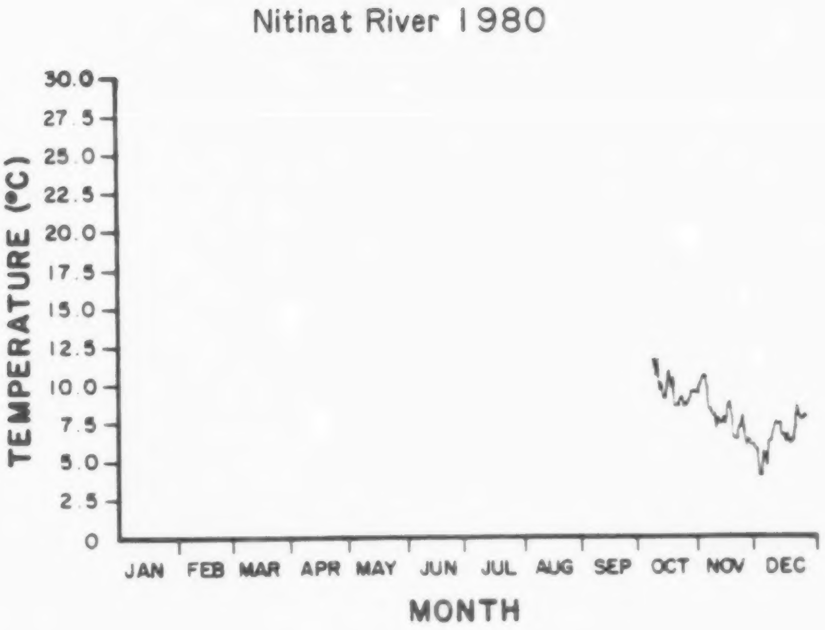
MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	8.08	5
FEBRUARY	-	-	7.3	3
MARCH	-	-	6.7	4
APRIL		NO DATA		
MAY		NO DATA		
JUNE	-	-	6.9	2
JULY	-	-	8.05	2
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	-	-	11.17	3
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

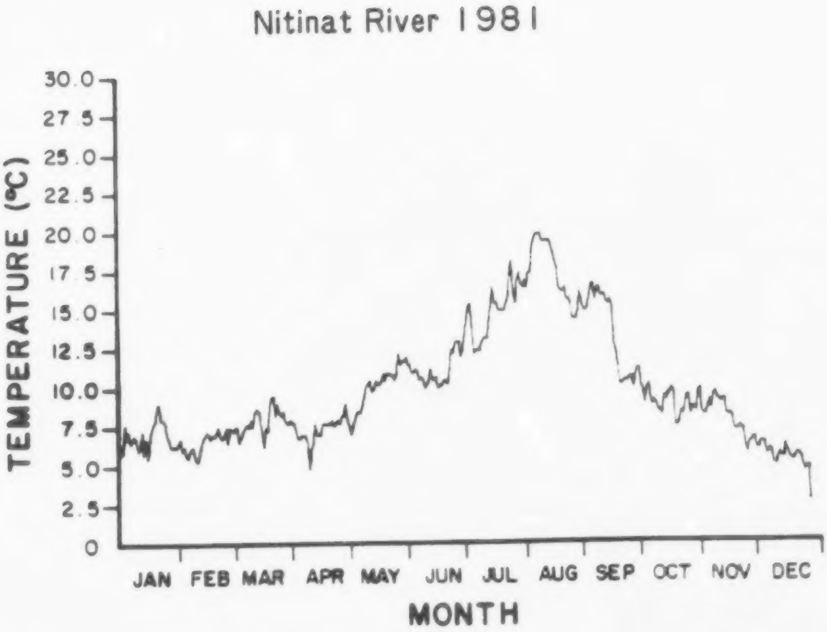
WELL OW-1 1984

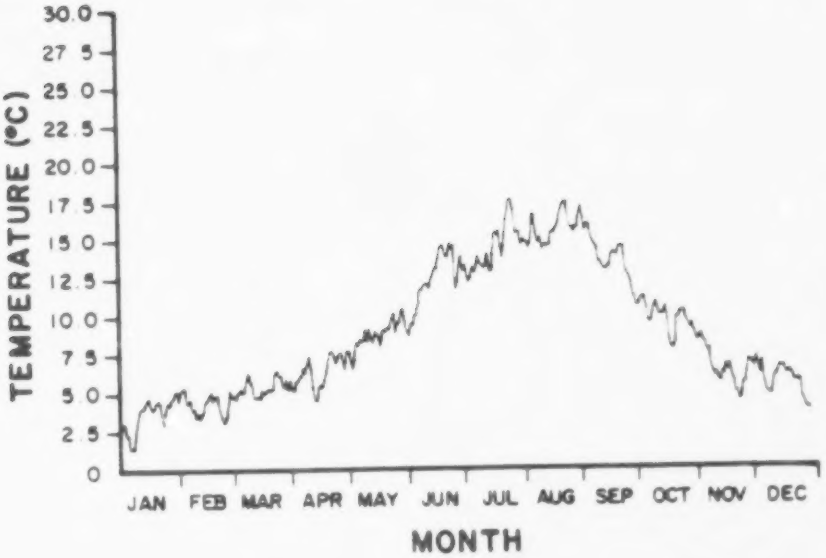
MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	-	-	10.3	2
OCTOBER	-	-	10.9	2
NOVEMBER	-	-	10.57	3
DECEMBER	-	-	9.4	2

WELL OW-1 1985

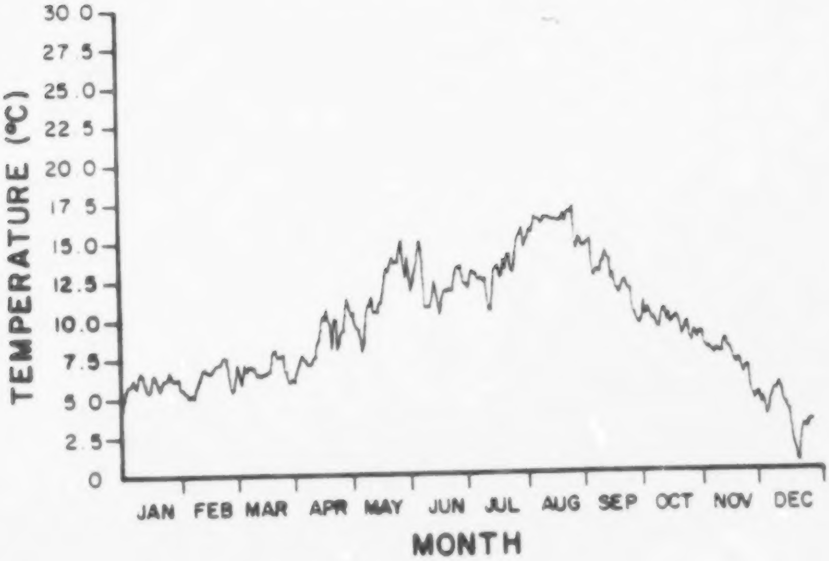
MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	8.3	1
FEBRUARY	-	-	7.7	1
MARCH	-	-	6.2	1
APRIL	-	-	5.8	1
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	-	-	10	1
NOVEMBER		NO DATA		
DECEMBER	-	-	8.7	1


Nitinat River 1980


Nitinat River 1981



Nitinat River 1982



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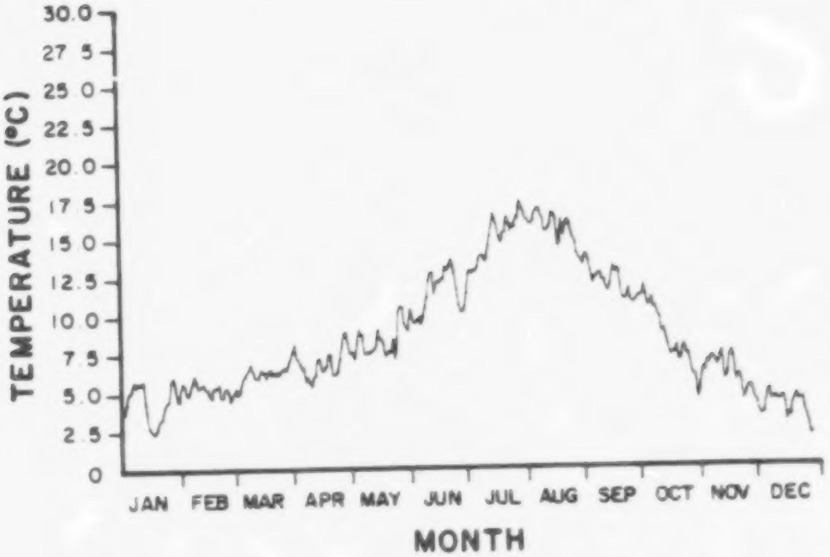
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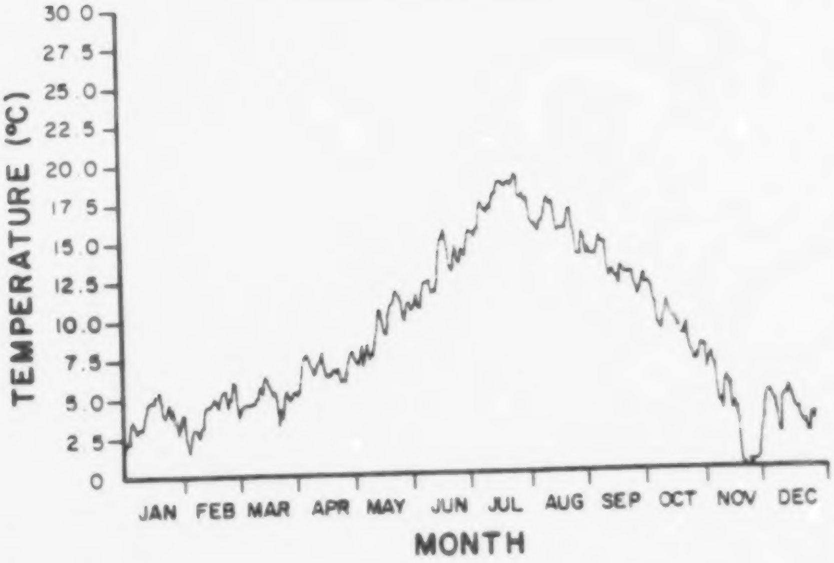
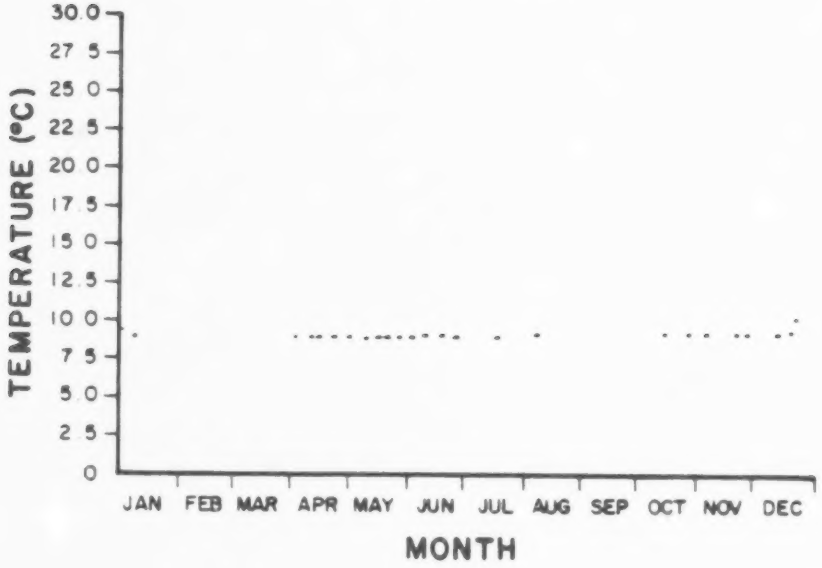

Nitinat River 1985

Well DH-3 1984



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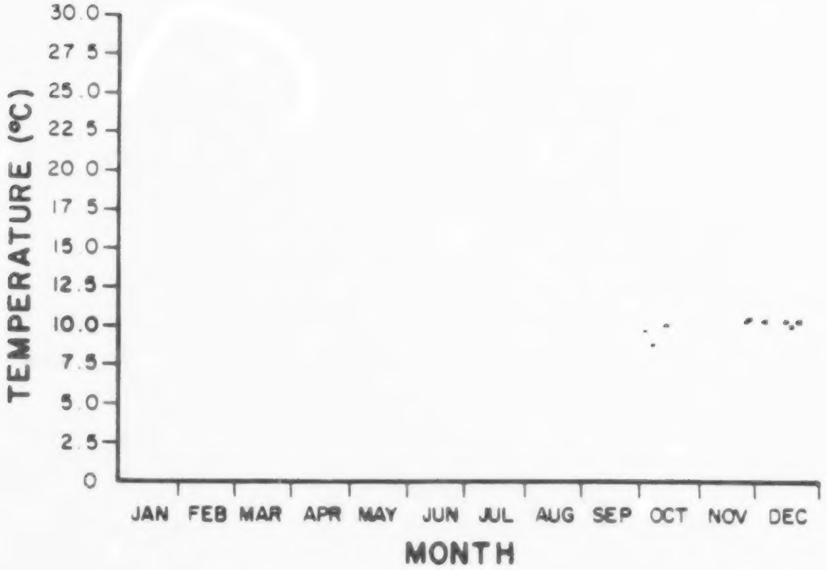

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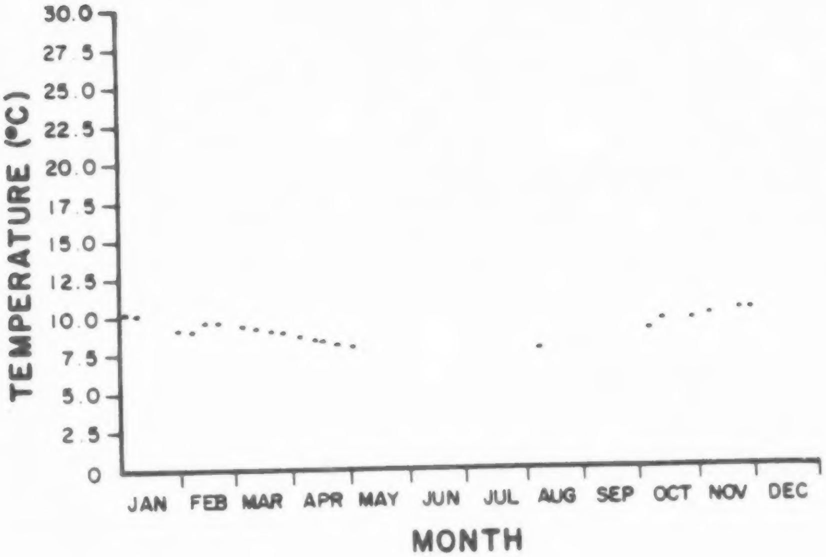

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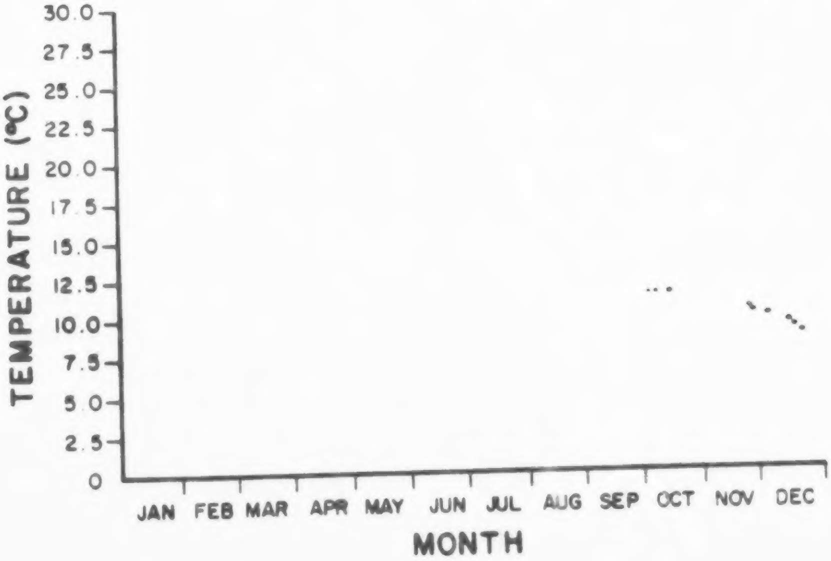

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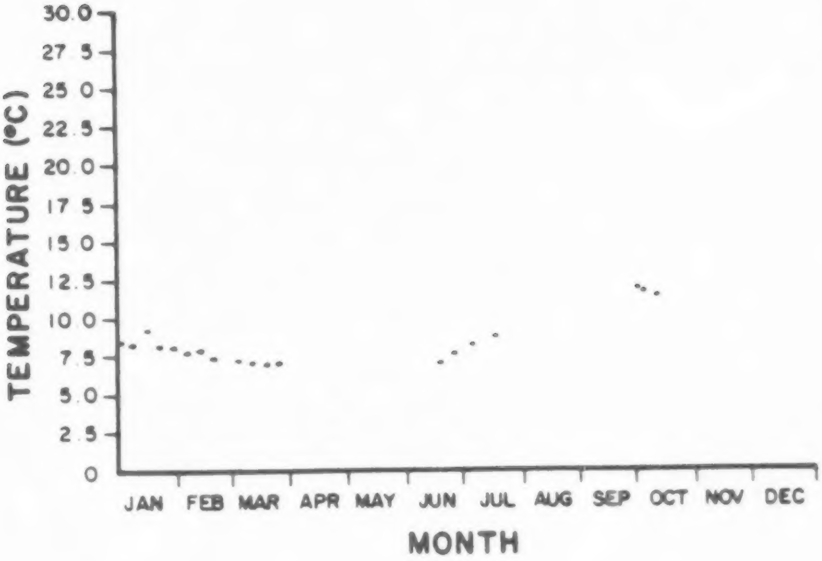
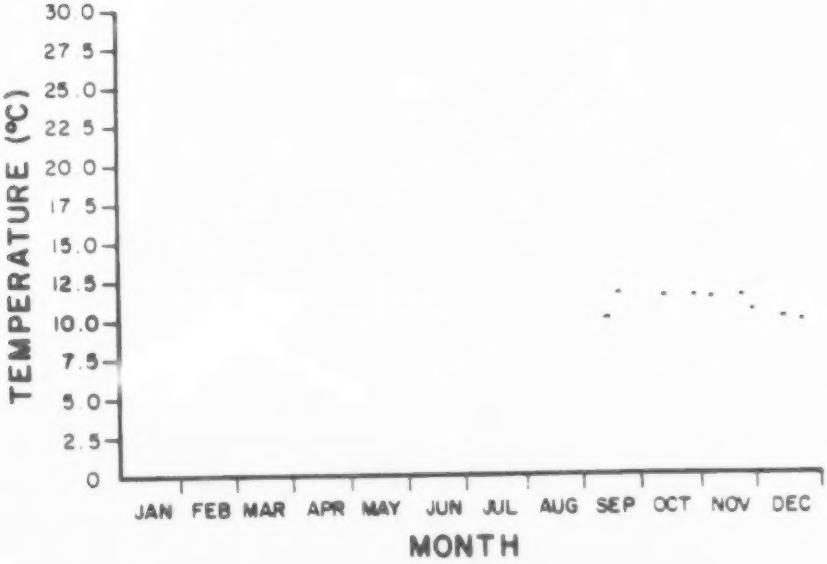


Well OW-1 1984



Facility: **PALLANT**

Location:

Located at the head of Cumshewa Inlet, which is 48 km south of Sandspit on Moresby Island, in the Queen Charlotte Islands.

Description:

This Japanese-style hatchery was constructed in 1978 primarily to boost chum stocks for commercial catch. Coho were enhanced to offset their anticipated increased interception in the chum fishery.

Egg targets for 1985 were 140 K coho and 9.5 M chinook. Eggs are obtained from Pallant Creek and Mathers hatchery. Chum juveniles are reared and released from seapens in the Pallant estuary, and from raceways into Mathers Creek. Coho are released into the Pallant and Braverman watersheds.

Water Sources:

Surface. A gravity feed intake from Pallant Creek supplies all the water for the hatchery.

Groundwater. No groundwater supply has been located.

General Water Quality:

Water quality is good, except for variable silting during freshets. Temperatures can exceed recommended levels during summer months. There is no provision for temperature manipulation.

WATER QUALITY VALUES FOR PALLANT

(below detection limits = 0)

PARAMETERS	OCT5/78 PALLANT CREEK	NOV26/76 PALLANT CREEK	MAR7/77 PALLANT CREEK	APR12/77 PALLANT CREEK	JUN17/77 PALLANT CREEK	SEP21/77 PALLANT CREEK	OCT5/77 PALLANT CREEK	NOV9/77 PALLANT CREEK	DEC28/77 PALLANT CREEK	JAN12/78 PALLANT CREEK	FEB8/78 PALLANT CREEK
Alkalinity	17	15	15.5	16	16						
Ammonia	.008										
CO2											
Chloride	3.8	3.9	3.7	4.1	4						
Color											
Conductivity Field											
Conductivity Lab	50.2	48	51		50						
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness											19
Nitrite	.005			0		0	0	0	0	0	0
Nitrate	.067			.046		.013	.029	.063	.068	.073	.075
pH-Field											
pH-Lab	7.5	7.4	7.2	7.3							
Phosphate										0	0
Residue Filterable	42	38	35	36	35	38	36	40	42	40	31
Residue Non-Filter										0	0
Silica										1.67	.6
Sulphate										4.05	3.6
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum										0	0
As-Arsenic										0	0
Ba-Barium										.0032	.0049
Ca-Calcium										6.51	5.93
Cd-Cadmium										0	0
Co-Cobalt										0	0
Cr-Chromium										0	0
Cu-Copper						0	0	0	0	0	0
Fe-Iron	.14					.08	.07	.11	.075	.079	.202
Hg-Mercury	0								0	0	0
K—Potassium										.15	
Mg-Magnesium										.99	1.03
Mn-Manganese										.0128	.0213
Mo-Molybdenum										0	0
Na-Sodium										2.62	2.25
Ni-Nickle										0	0
P—Phosphorus											
Pb-Lead	0					0	.02		0	0	0
Sb-Antimony										0	0
Se-Selenium										0	0
Si-Silicon										1.53	
Sn-Tin										0	0
Sr-Strontium										.015	.0169
Ti-Titanium										0	0
V—Vanadium										0	0
Zn-Zinc	0					.01	.02		0	0	.037

WATER QUALITY VALUES FOR PALLANT
(below detection limits = 0)

PARAMETERS	APR10/78 PALLANT CREEK	APR13/78 PALLANT CREEK	APR21/78 PALLANT CREEK	MAY11/78 PALLANT CREEK	MAY27/78 PALLANT CREEK	JUN9/78 PALLANT CREEK	JUL6/78 PALLANT CREEK	AUG3/78 PALLANT CREEK	SEP13/78 PALLANT CREEK	DEC7/78 PALLANT CREEK	JAN12/79 PALLANT CREEK
Alkalinity			15.6							14.9	12.3
Ammonia			0							.0079	0
CO2											
Chloride			5.05							4.5	4.9
Color			30								
Conductivity Field											
Conductivity Lab			54.6							49.6	53
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	15	14.7	18.5	18.8	21.9		19.6	35.8	44.6	19.1	21
Nitrite	0	0	0	0	0	0	0	0	0	0	0
Nitrate	.067	.067	.0599	.059	.044	.039	.036	.03	.046	.061	.056
pH-Field											
pH-Lab										7.4	7.3
Phosphate	0	0	.01	0	0	0	0	.005	0	.0305	.0265
Residue Filterable	42	46	47	41	39	41	43.3	43	41	* 42	
Residue Non-Filter	0	0	0	0	0	0	0	0	0	* 20	
Silica	1.55	1.55	1.35	1.5	.15	1.47	1.4	1.25	1.39	.85	1
Sulphate	2.9	2.8	3.25	3.05	3.04	1.7	2.9	2.44	3.25	2.69	3.1
Taste											
Temperature											
Turbidity			6.4							6.7	4
METALS—											
Al-Aluminum	0	0	.16	0	0	0	0	0	0	.45	.29
As-Arsenic		0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	.0044	0	0	0	0	.0646	0	.0048	.0048
Ca-Calcium	4.79	4.65	5.89	6.07	7.42	5.53	6.15	12.6	12.7	5.75	6.4
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	.021	0
Fe-Iron	0	0	.205	.025	.053	.046	.043	.083	.038	.828	.34
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K--Potassium			.16							.017	
Mg-Magnesium	.75	.74	.921	.873	.817	.832	1.04	1.05	3.12	1.14	1.23
Mn-Manganese	.0106	.0069	.0208	.0091	.0123	.008	.009	.0163	0	.0457	.0295
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	2.01	1.94	2.3	2.9	2.61	2.66	2.7	3.34	1.83	1.76	2.19
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus			0							0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	.96		1.57	1.4	1.39	1.03				1.54	1.94
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.0016		.0161	.0151	.0162	.0154	.018		.0197	.0164	.0167
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	.014
V--Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	.596	0	.173	.101

WATER QUALITY VALUES FOR PALLANT

(below detection limits = 0)

PARAMETERS	MAY1/79 PALLANT CREEK	APR/82 PALLANT HATCHERY	OCT26/83 PALLANT HATCHERY	OCT26/83 PALLANT HATCHERY	FEB/85 PALLANT HATCHERY	FEB/85 PALLANT HATCHERY	FEB/85 BRAVER-MAN	FEB/85 BRAVER-MAN
Alkalinity	15.3	16	15.5		14.6		7.3	
Ammonia	0	.005	.01		0		0	
CO2								
Chloride	4.88	4.1	4.5		3.8		6.1	
Color	24				0		0	
Conductivity Field								
Conductivity Lab	55	53.6	53.3		53		43	
Dissolved O2-ppm								
Dissolved O2-%sat								
Dissolved Gas Tot								
Dissolved Nitrogen								
Hardness	18.5	19	19.5	19.6	17.2	17.4	12	10.7
Nitrite	0	0	0		0		0	
Nitrate	.0435	.06	.06		.07		.03	
pH-Field								
pH-Lab	7.6	7.4	7.2		7		6.7	
Phosphate	.01	.005	.006		0		0	
Residue Filterable	44	44	42		37		33	
Residue Non-Filter	0	0	0	0	0	0	0	
Silica	1.55	1.4	1.5	1.4	.3	.3	.2	.2
Sulphate	2.9	3.4	2.9		4		3	
Taste		0						
Temperature								
Turbidity	56	0	.6		.5		.2	
METALS—								
Al-Aluminum	.18		.06	.07	.05	.05	.06	.06
As-Arsenic	0		0	0	0	0	0	0
Ba-Barium	.0034		.003	.004	.002	.003	.002	.002
Ca-Calcium	5.79		6.2	6.2	5.2	5.3	3.6	3.2
Cd-Cadmium	0		0	0	.0007	0	0	0
Co-Cobalt	0		0	0	0	0	0	0
Cr-Chromium	0		0	0	0	0	0	0
Cu-Copper	0		0	0	.004	0	0	0
Fe-Iron	.25		.174	.176	.099	.1	.075	.064
Hg-Mercury	0		0	0	0		0	
K--Potassium	.183		.14	.15	.11	.11	.11	.12
Mg-Magnesium	.981		1	1	.9	.9	.6	.5
Mn-Manganese	.0184		.018	.02	.012	.013	.006	.005
Mo-Molybdenum	0		0	0	0	0	0	0
Na-Sodium	2.4		2.6	2.6	2.2	2.2	2.6	2.4
Ni-Nickle	0		0	.03	0	0	0	0
P--Phosphorus	0		0	0	0	0	0	0
Pb-Lead	0		0	0	0	0	.001	0
Sb-Antimony	0		0	0	0	0	0	0
Se-Selenium	0		0	0	0	0	0	0
Si-Silicon	1.68	1.4	1.5	1.4	.3	.3	.2	.2
Sn-Tin			0	0	0	0	0	0
Sr-Strontium	.0158		.017	.016	.014	.014	.007	.006
Ti-Titanium	.014		0	.002	0	0	0	0
V--Vanadium	0		0	0	0	0	0	0
Zn-Zinc	0		0	0	0	0	[illegible]	0

PALLANT CREEK 1978

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER	-	-	11	27
NOVEMBER	-	-	7.57	30
DECEMBER	-	-	5.6	31

PALLANT CREEK 1979

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	3.69	31
FEBRUARY	-	-	2.95	28
MARCH	-	-	3.25	31
APRIL	-	-	6.29	30
MAY	-	-	9.81	31
JUNE	-	-	13.82	30
JULY	-	-	16.27	31
AUGUST	-	-	17.73	31
SEPTEMBER	-	-	15.68	30
OCTOBER	-	-	11.63	31
NOVEMBER	-	-	7.8	30
DECEMBER	-	-	5.4	31

PALLANT CREEK 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	3.52	31
FEBRUARY	-	-	3.23	28
MARCH	-	-	4.13	31
APRIL	-	-	5.4	30
MAY	-	-	10.79	31
JUNE	-	-	16.03	30
JULY	-	-	16.61	31
AUGUST	-	-	17.45	31
SEPTEMBER	-	-	15.08	30
OCTOBER	-	-	11.9	31
NOVEMBER	-	-	8.9	30
DECEMBER	-	-	5.24	31

PALLANT CREEK 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	5.53	31
FEBRUARY	-	-	5.32	28
MARCH	-	-	6.27	11
APRIL	-	-	6.88	30
MAY	-	-	9.94	31
JUNE	-	-	13.57	30
JULY	-	-	18.6	31
AUGUST	-	-	19.37	23
SEPTEMBER	-	-	15.48	30
OCTOBER	-	-	11.11	31
NOVEMBER	-	-	8.47	30
DECEMBER	-	-	5.56	31

PALLANT CREEK 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	4.16	31
FEBRUARY	-	-	3.77	28
MARCH	-	-	4.1	31
APRIL	-	-	5.45	30
MAY	-	-	7.81	31
JUNE	-	-	15.73	30
JULY	-	-	17.02	31
AUGUST	-	-	16.44	31
SEPTEMBER	-	-	15.22	30
OCTOBER	9.6	15	12.17	31
NOVEMBER	5.5	9.8	7.44	30
DECEMBER	-	-	5.35	31

PALLANT CREEK 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	4	5.5	4.8	31
FEBRUARY	4.4	5.4	4.97	28
MARCH	4.4	7.1	5.66	31
APRIL	6.1	13.4	8.29	30
MAY	10.6	15.6	13.5	31
JUNE	13.4	18.4	15.13	30
JULY	13.9	18.9	16.61	31
AUGUST	15.2	18.7	16.83	31
SEPTEMBER	12.89	17.7	14.64	30
OCTOBER	9.2	13.9	11.17	31
NOVEMBER	5.4	9.3	6.86	30
DECEMBER	2.88	5.6	4.37	31

PALLANT CREEK 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.8	5.2	4.46	31
FEBRUARY	4.17	5.4	4.62	28
MARCH	4.44	6.39	5.29	31
APRIL	5.11	6.67	6.09	30
MAY	6.94	10.89	8.78	31
JUNE	9.72	15.83	12.58	30
JULY	13.33	18.72	15.49	31
AUGUST	15	17.67	16.01	31
SEPTEMBER	12.06	15	13.23	30
OCTOBER	6.11	13.22	9.85	31
NOVEMBER	5.06	7.11	6.04	30
DECEMBER	2.78	6.67	4.88	31

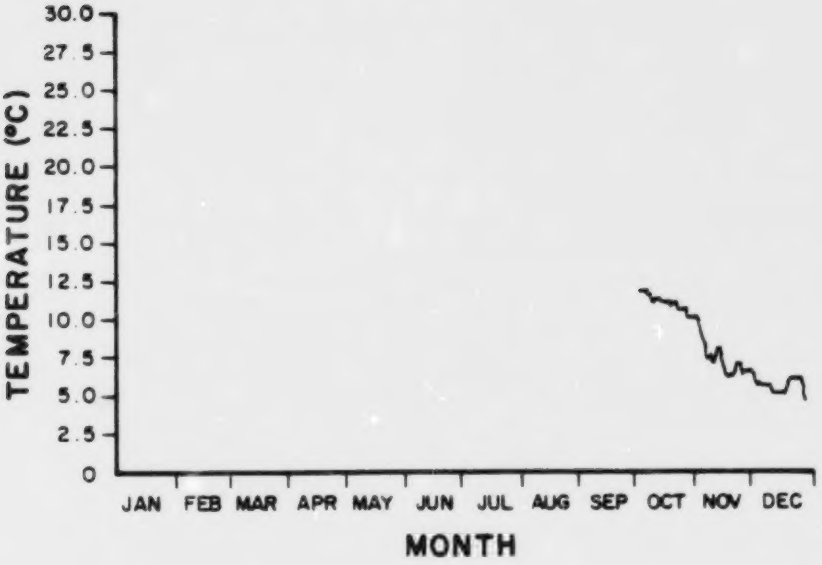
PALLANT CREEK 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.28	5	4.27	31
FEBRUARY	1.94	4.39	3.64	28
MARCH	4.11	5.5	4.67	31
APRIL	4.67	7.72	5.89	30
MAY	5.83	15.83	9.64	31
JUNE	10.28	16.22	13.51	30
JULY	12.5	20.28	16.18	31
AUGUST	14.56	20.56	17.15	31
SEPTEMBER	13.89	18.78	15.61	30
OCTOBER	7.94	14.44	11.38	31
NOVEMBER	3.11	8.5	6.11	30
DECEMBER	2.67	3.78	3.27	31

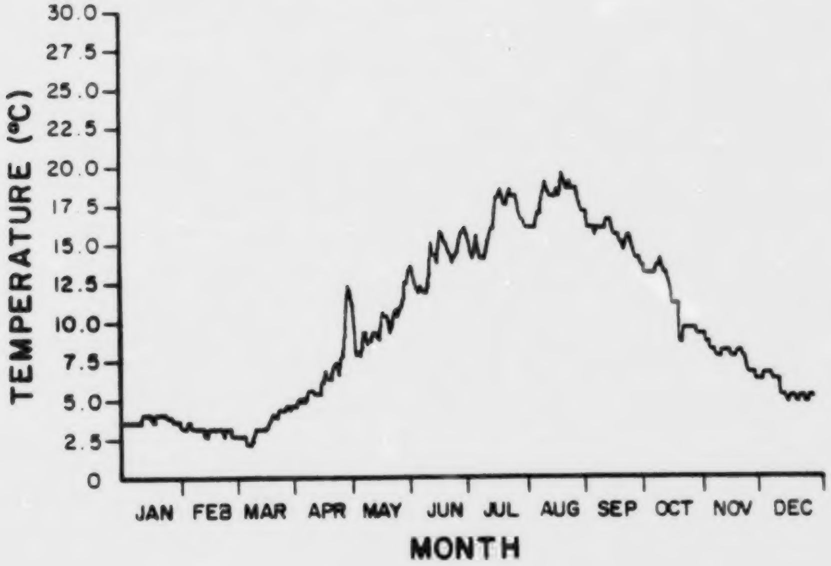
PALLANT CREEK 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.89	4.28	3.71	31
FEBRUARY	.61	4.33	3.17	28
MARCH	3.28	5.11	4.26	31
APRIL		NO DATA		
MAY	5.78	12.22	8.59	31
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

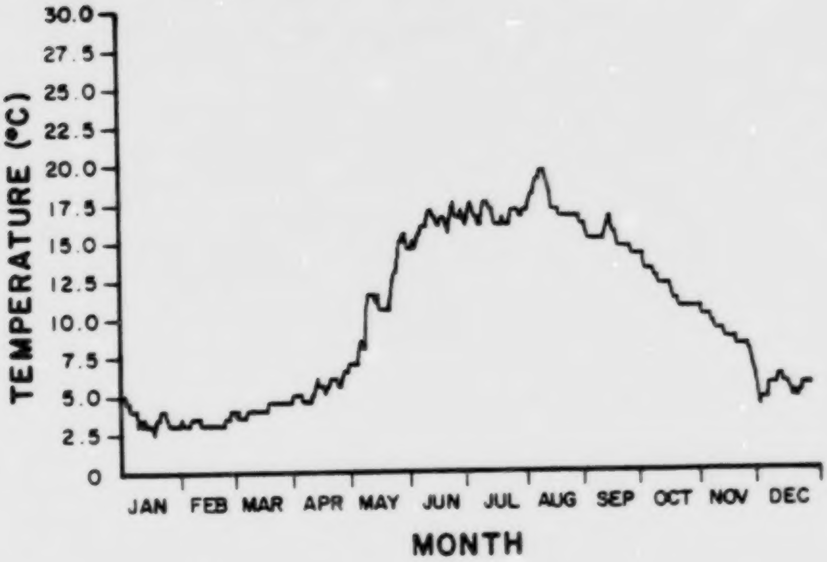
Pallant Creek 1978



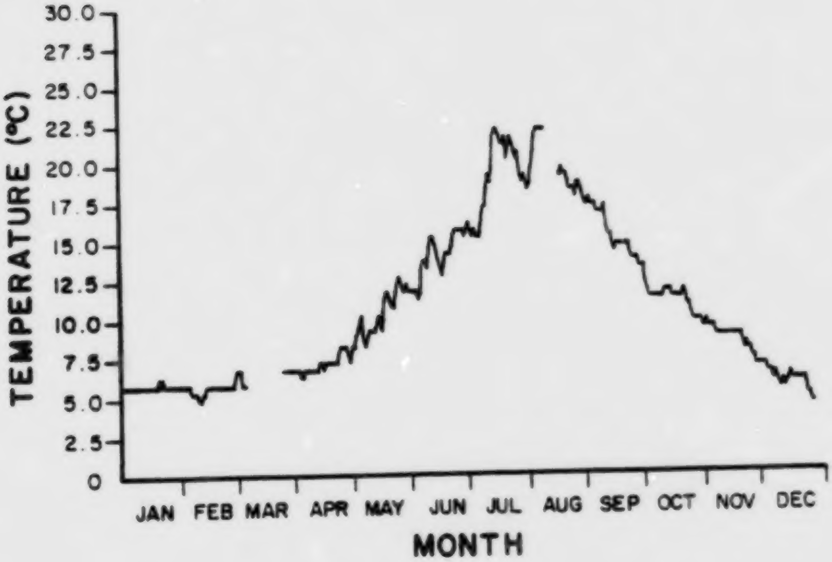
Pallant Creek 1979



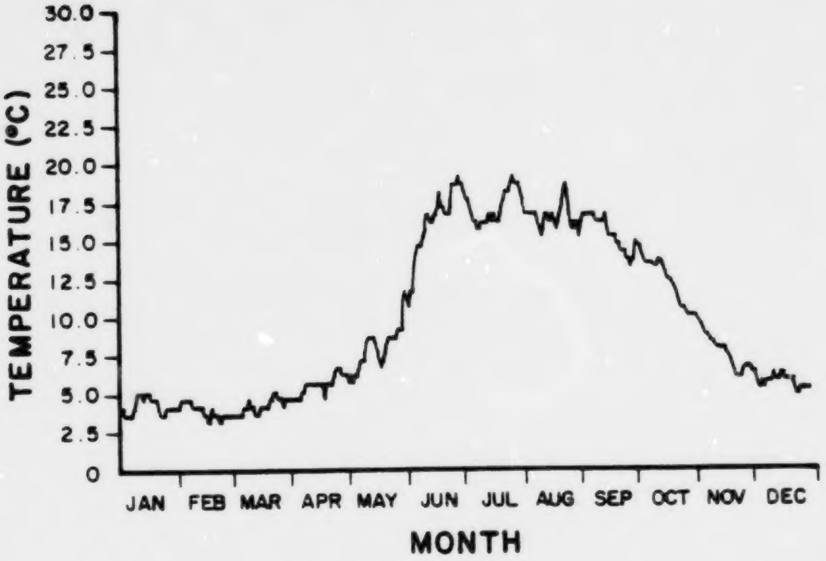
Pallant Creek 1980



Pallant Creek 1981



Pallant Creek 1982



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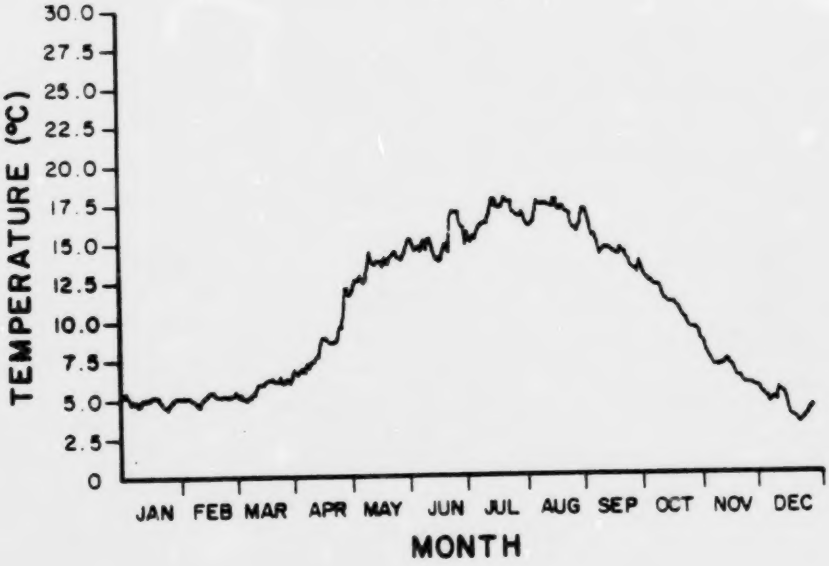

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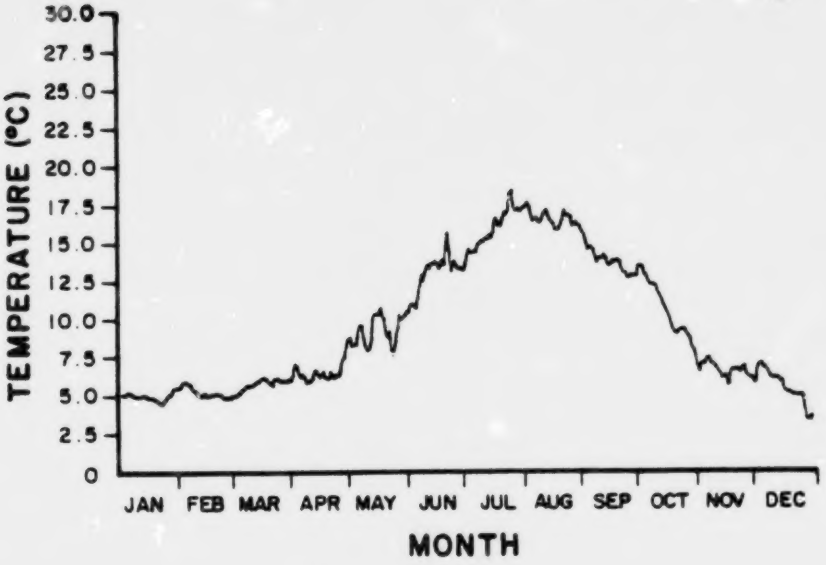
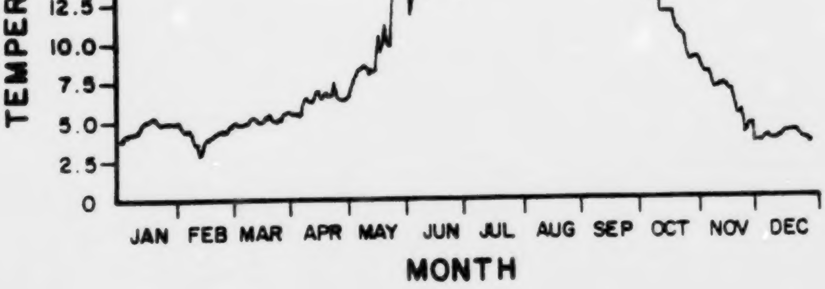
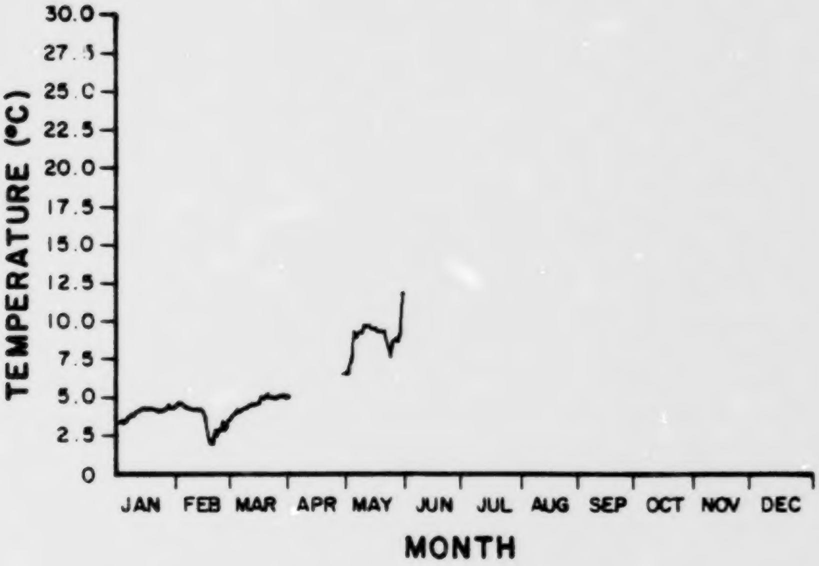


Pallant Creek 1985



Pallant Creek 1986



Facility: PINKUT CREEK

Location:

Located on Babine Lake, 50 km from Burns Lake off Highway 35.

Description:

The spawning channel was built in 1968 to increase the number of sockeye fry rearing in the underutilized Babine Lake.

Egg incubating capacity is 90 M sockeye. Eggs are taken from Pinkut Creek stocks, fry return to Pinkut Creek.

Water Sources:

Surface. A pipeline from a dam on Pinkut Creek supplies much of the water, but a deep lake water pumped from an intake in Babine Lake supplies warmer water for the channel to prevent ice formation during cold spells.

Groundwater. None used.

General Water Quality:

Water quality is satisfactory for incubation purposes, although somewhat cold.

Special Notes:

Water quality samples of creek water are taken as the water enters the channel. Auxilary water is from Babine Lake.

WATER QUALITY VALUES FOR PINKUT
(below detection limits = 0)

PARAMETERS	AUG4/66 SPAWNING CHANNEL	AUG19/66 SPAWNING CHANNEL	SEP14/66 SPAWNING CHANNEL	SEP27/66 SPAWNING CHANNEL	OCT18/66 SPAWNING CHANNEL	AUG/71 SPAWNING CHANNEL	NOV19/71 SPAWNING CHANNEL	NOV19-23/71 SPAWNING CHANNEL	NOV22/71 SPAWNING CHANNEL	FEB27/74 SPAWNING CHANNEL	JUN/80 SPAWNING CHANNEL
Alkalinity							47.5	50		42	
Ammonia											106.4
CO2								3.3			
Chloride								1.3	1.67	1	
Color								0			
Conductivity Fielc											
Conductivity Lab								10.4			
Dissolved O2-ppm	8.6	8.9	9.1	9.28	10.59	7.7	11.2		10.2		10.7
Dissolved O2 -%sat						82					105.6
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness							36.2	39.3		30	
Nitrite								0	0		
Nitrate							5	4.6	6.2	6.5	
pH-Field											
pH-Lab							7.6	7.6	7.5	7.6	
Phosphate								.08			
Residue Filterable											
Residue Non-Filter											
Silica								8.9			
Sulphate								2			
Taste											
Temperature	16.7	15	12.8	10	4.1						11
Turbidity								1			
METALS—											
Al-Aluminum											
As-Arsenic											
Ba-Barium											
Ca-Calcium											
Cd-Cadmium											
Co-Cobalt											
Cr-Chromium								0			
Cu-Copper							.05	.04		.08	
Fe-Iron							.02	.03		.1	
Hg-Mercury											
K--Potassium											
Mg-Magnesium											
Mn-Manganese											
Mo-Molybdenum											
Na-Sodium											
Ni-Nickle											
P--Phosphorus											
Pb-Lead											
Sb-Antimony											
Se-Selenium											
Si-Silicon											
Sn-Tin											
Sr-Strontium											
Ti-Titanium											
V--Vanadium											
Zn-Zinc											

PINKUT CREEK 1971

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	0	0	24
FEBRUARY	0	0	0	28
MARCH	0	.06	0	31
APRIL	0	5.06	1.73	28
MAY	2.39	8.72	6.23	31
JUNE	7.28	13.94	11.2	30
JULY	11.44	21.94	15.23	25
AUGUST	13.39	20.33	16.71	28
SEPTEMBER	7.11	15.28	10.6	30
OCTOBER	1	8.44	4.92	31
NOVEMBER	.33	2.06	1.4	30
DECEMBER	0	.78	.07	31

PINKUT CREEK 1972

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	0	0	31
FEBRUARY	0	0	0	28
MARCH	0	2.17	.33	31
APRIL	.78	5.56	2.55	30
MAY	2.61	8.78	5.61	31
JUNE	7.44	11.28	9.46	30
JULY	10.17	18.06	15.43	31
AUGUST	12.89	18.78	15.47	26
SEPTEMBER	6.33	14.78	10.34	30
OCTOBER	2.56	7.11	4.49	30
NOVEMBER	.39	3.94	1.62	30
DECEMBER	.06	1.06	.34	30

PINKUT CREEK 1973

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.06	.5	.32	15
FEBRUARY		NO DATA		
MARCH	.28	2.56	1.46	26
APRIL	.78	5	3.1	30
MAY	3	10.78	7.21	31
JUNE	6.72	13.72	9.74	23
JULY	12.11	19.22	14.58	31
AUGUST	11.56	19.22	14.54	14
SEPTEMBER	9.39	12.5	10.56	10
OCTOBER	1.44	5.89	3.86	25
NOVEMBER	1.44	2.5	1.97	3
DECEMBER	.28	.67	.47	16

PINKUT CREEK 1974

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.17	.78	.38	31
FEBRUARY	.28	1.67	.89	28
MARCH	0	2.5	.93	31
APRIL	.11	5.94	2.42	30
MAY	1.67	6.89	4.79	31
JUNE	5	6.39	5.8	8
JULY		NO DATA		
AUGUST	14.44	17.56	15.89	17
SEPTEMBER	6.17	8	7.08	2
OCTOBER	2.72	8.28	6.03	31
NOVEMBER	-.06	4.22	1.25	30
DECEMBER	-.06	1.89	.88	31

PINKUT CREEK 1975

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.39	1	.2	30
FEBRUARY	-.44	.39	-.09	28
MARCH	-.28	.28	-.02	31
APRIL	0	6.22	1.91	24
MAY	3.39	13.11	7.91	31
JUNE	7.89	17.83	10.92	30
JULY	13.22	21.56	17.3	31
AUGUST	11.06	17	14.07	31
SEPTEMBER	9.17	14	11.87	30
OCTOBER	2.83	11.72	6.36	19
NOVEMBER	-.06	.56	.25	1
DECEMBER	-.06	.89	.4	23

PINKUT CREEK 1976

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.17	.78	.2	16
FEBRUARY	-.22	.61	.19	4
MARCH	-.28	2.83	.8	31
APRIL	-.11	4.67	2.49	10
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

PINKUT CREEK 1977

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	8.5	12.44	10.6	20
OCTOBER	1.33	7.44	4.91	27
NOVEMBER	-.33	2.44	.75	30
DECEMBER	-.56	.39	-.43	18

PINKUT CREEK 1978

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.83	-.78	-.81	2
FEBRUARY		NO DATA		
MARCH	.22	2.17	1.19	6
APRIL	.72	6.06	2.97	26
MAY	3.22	11.94	7.37	31
JUNE	8.39	17.61	13.76	29
JULY	13.83	20.22	17.5	30
AUGUST	13.78	20.67	17.16	30
SEPTEMBER	8.33	16.78	11.47	29
OCTOBER	2.72	9.33	6.65	31
NOVEMBER	.06	3.78	1.09	30
DECEMBER	-.33	1.22	.34	31

PINKUT CREEK 1979

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.33	.39	.04	31
FEBRUARY	-.33	.22	.02	28
MARCH	-.61	1.72	.07	31
APRIL	.78	7.17	3.21	30
MAY	3.11	7.17	5.7	31
JUNE	5.89	14.11	9.66	30
JULY	12.5	20.5	16.42	28
AUGUST	14.83	20.06	17.64	27
SEPTEMBER	8.94	18.94	12.95	30
OCTOBER	3.44	10.17	7.13	30
NOVEMBER	-.06	3.89	1.16	30
DECEMBER	-.06	1.44	.53	31

PINKUT CREEK 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.5	.611	-.07	31
FEBRUARY	-.222	1.333	.42	28
MARCH	-.222	3.056	.99	31
APRIL	-.056	6.444	3.84	12
MAY	3.778	13	9.86	31
JUNE	10.444	15.833	13.46	28
JULY		NO DATA		
AUGUST	11.056	17.5	15.49	6
SEPTEMBER	8.111	12.611	10.91	28
OCTOBER	3	9.556	6.3	31
NOVEMBER	-.556	4.389	1.69	30
DECEMBER	-.556	-.056	-.33	31

PINKUT CREEK 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.5	.33	-.12	31
FEBRUARY	-.5	.39	-.13	28
MARCH	-.06	3.44	1.46	28
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

PINKUT CREEK 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.56	1.11	-.01	23
FEBRUARY	-.56	1.67	.49	27
MARCH	0	5	2.06	26
APRIL	1.67	8.89	4.51	30
MAY	5	13.33	8.56	23
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

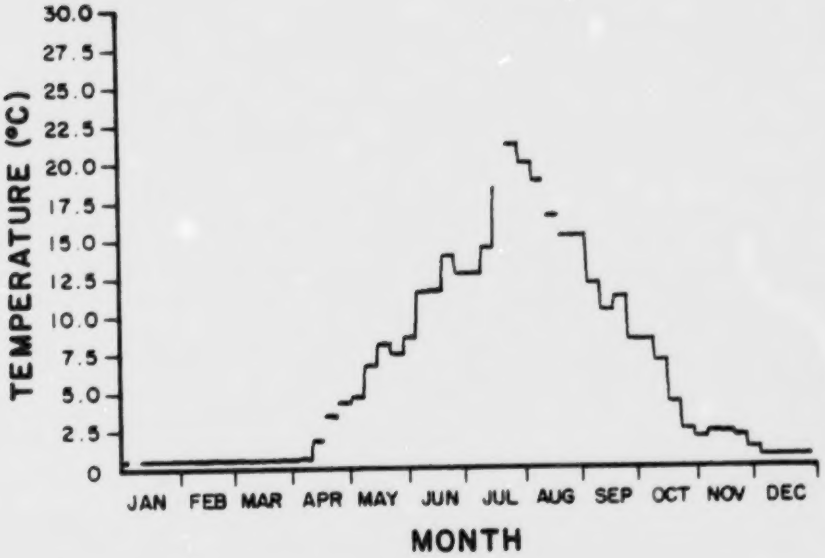
PINKUT CREEK 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH	-.28	3.33	1.23	7
APRIL	0	6.56	2.84	18
MAY	3.06	15.56	8.36	31
JUNE	8.33	20.83	13.09	30
JULY	9.72	24.44	16.62	30
AUGUST	10.83	19.72	15.51	23
SEPTEMBER		NO DATA		
OCTOBER	-.28	3.89	1.64	11
NOVEMBER	-1.11	.83	-.28	20
DECEMBER	-.28	.28	-.14	12

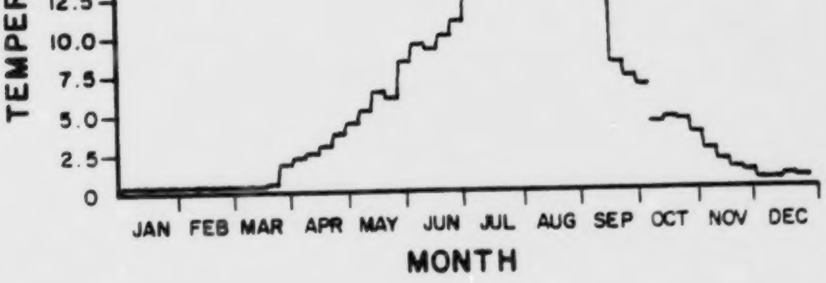
PINKUT CREEK 1986

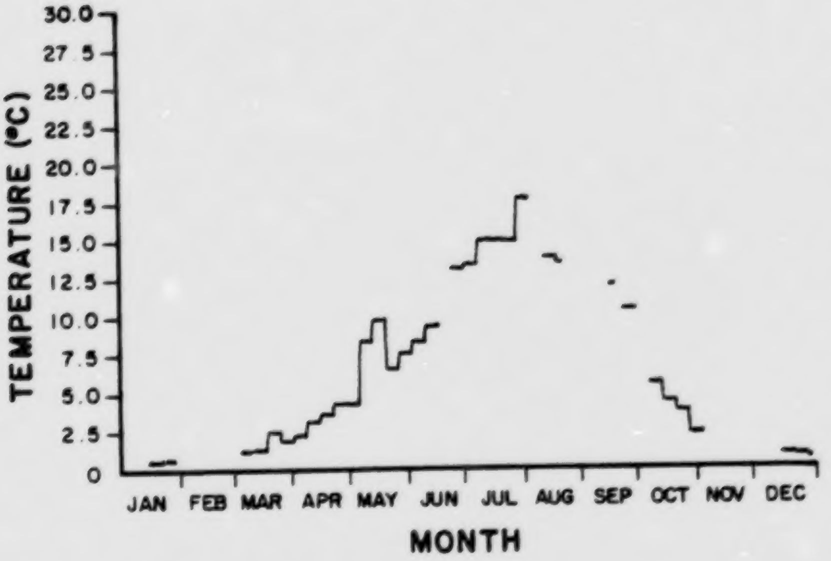
MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.56	.56	-.01	30
FEBRUARY	-1.94	1.94	.1	15
MARCH	0	4.17	1.39	31
APRIL	.28	6.94	3.5	30
MAY	2.78	6.67	4.49	3
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

Pinkut Creek 1971

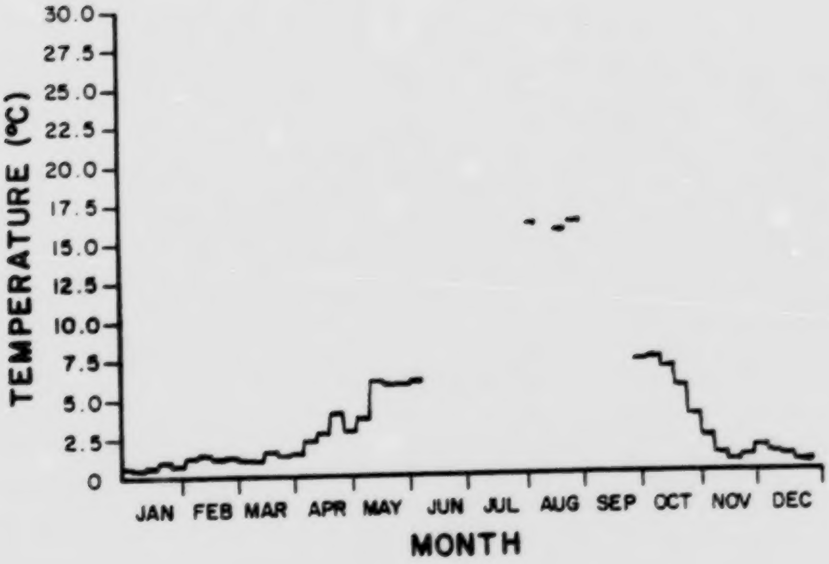


Pinkut Creek 1972



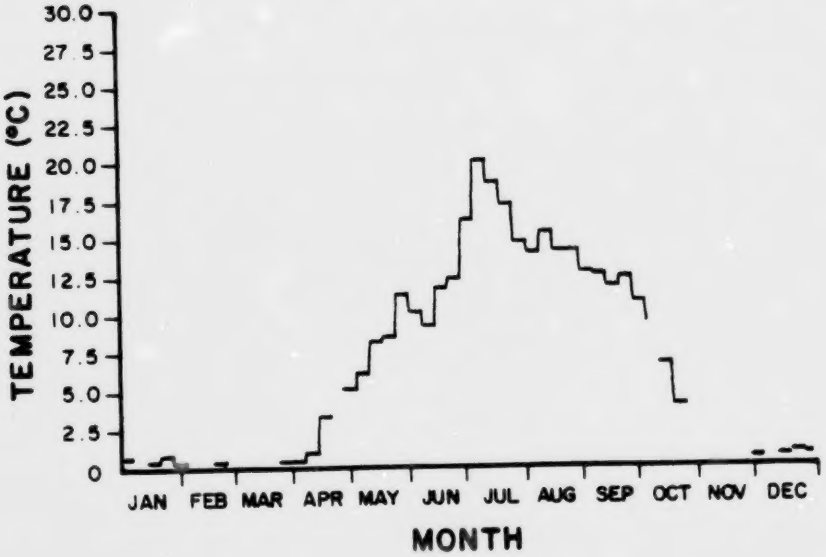


Pinkut Creek 1973

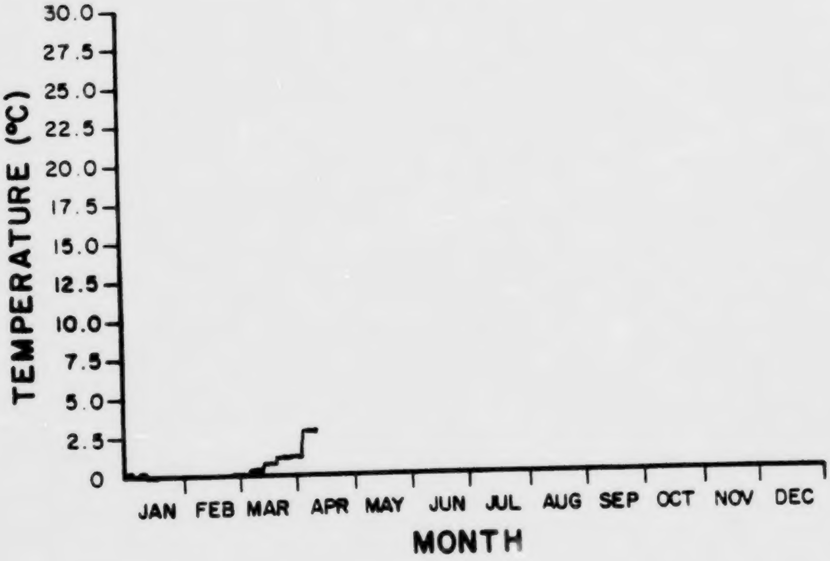


Pinkut Creek 1974

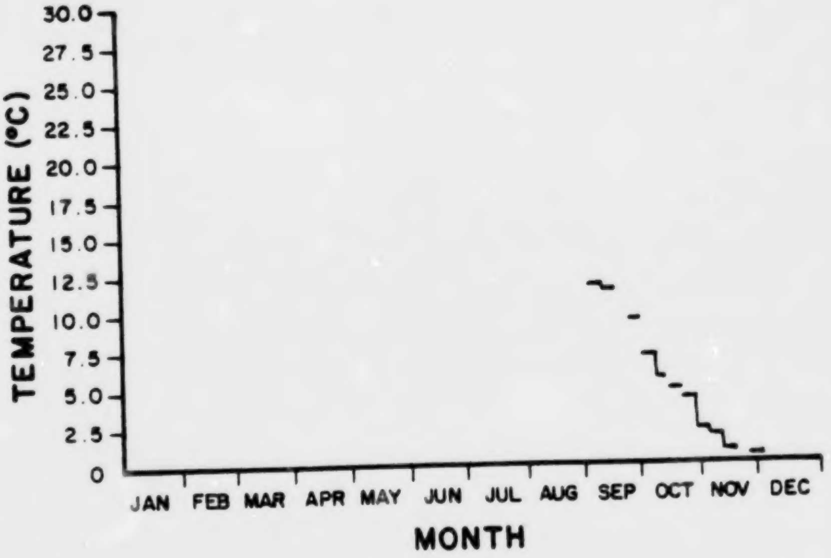
Pinkut Creek 1975



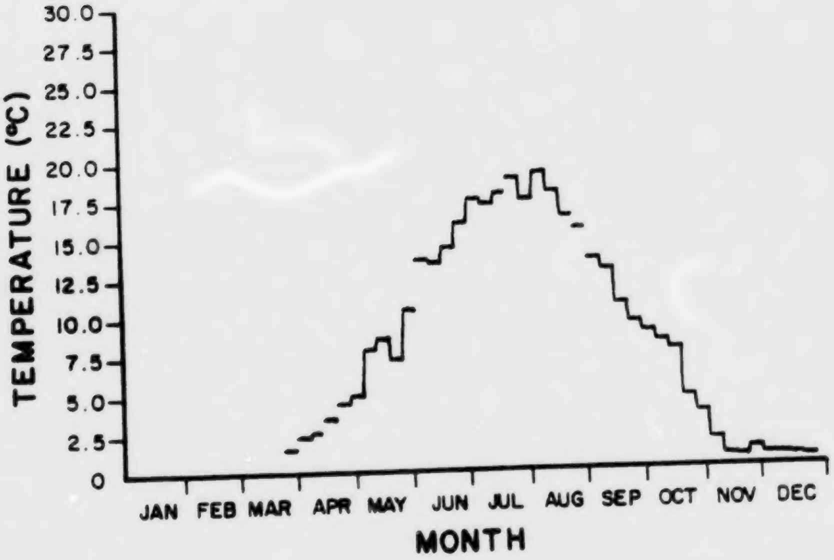
Pinkut Creek 1976

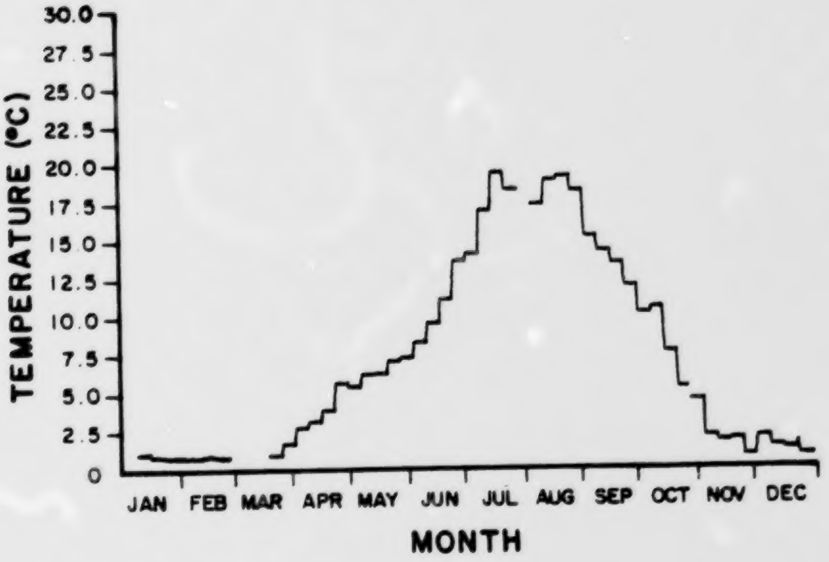


Pinkut Creek 1977

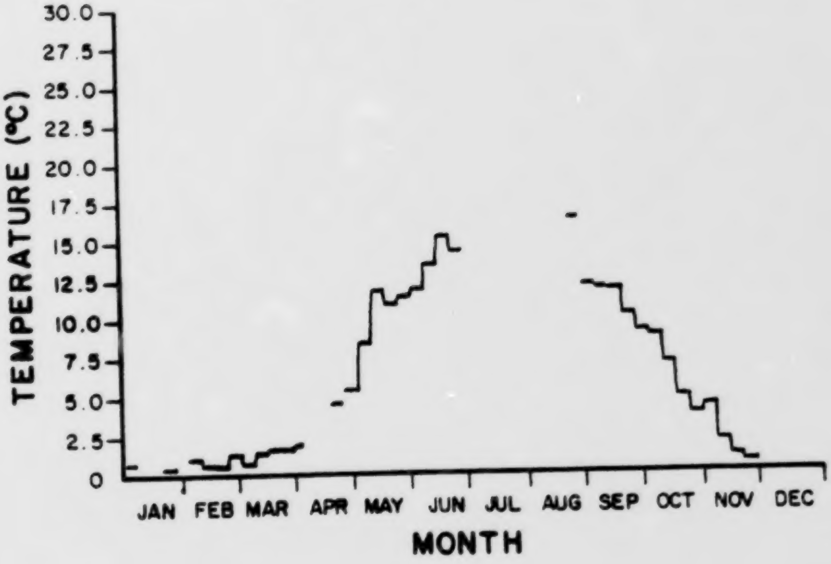


Pinkut Creek 1978



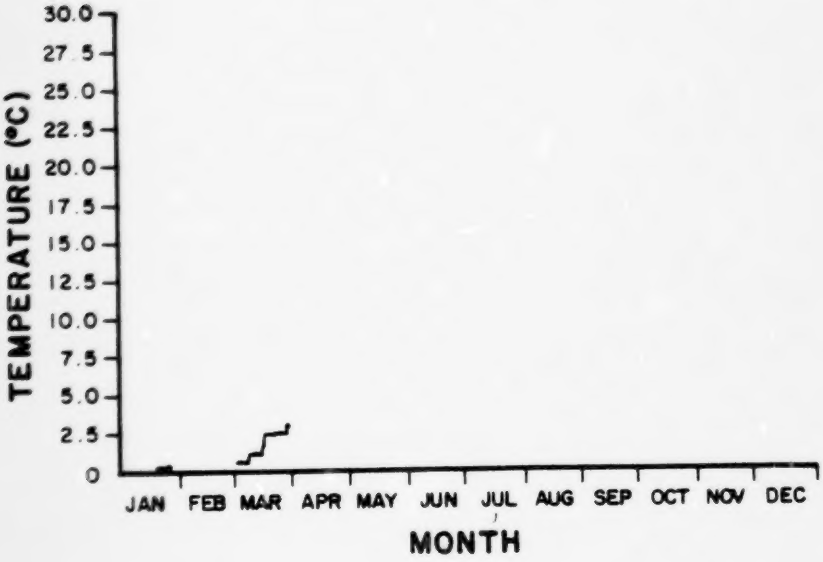


Pinkut Creek 1979



Pinkut Creek 1980

Pinkut Creek 1981



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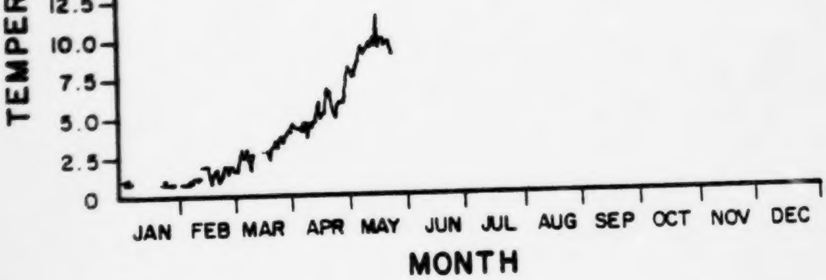
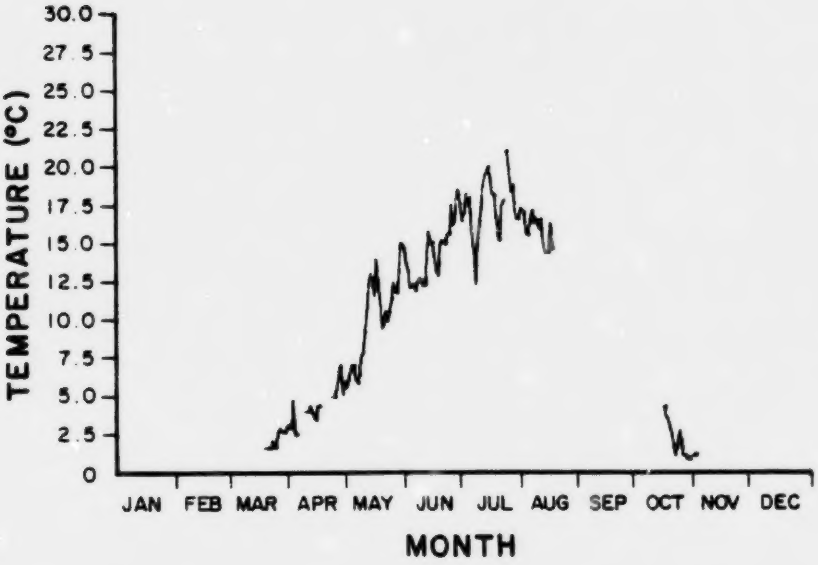


Pinkut Creek 1985



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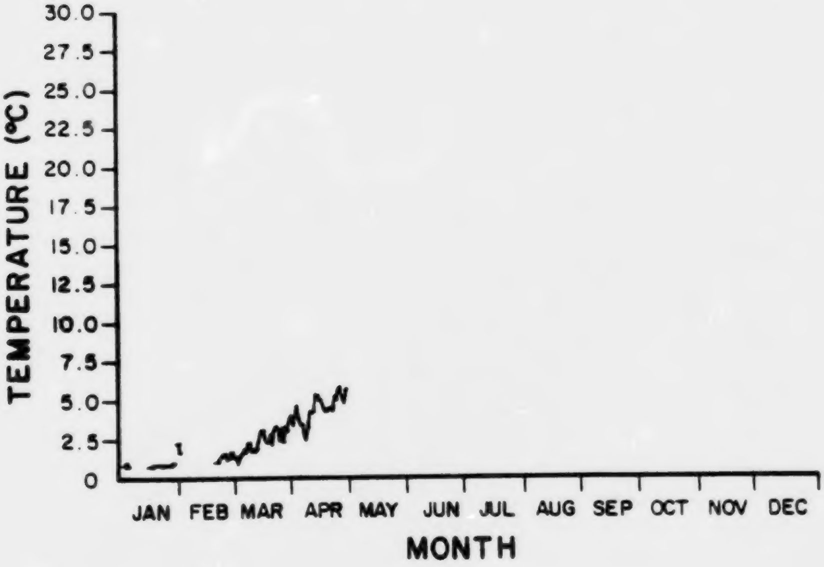


Facility: PUNTLEDGE/TSOLUM

Location:

The main hatchery is located 2 km west of Courtenay on the east coast of Vancouver Island. The upper hatchery is 9 km upstream from the main hatchery on the Puntledge River. The Tsolum project is located on Headquarters Creek, a tributary of the Tsolum River.

Description:

The main (lower site) hatchery, completed in 1979, now handles the capture and incubation of stocks. The upper site, constructed in 1965 as a spawning channel and expanded in 1978 to include Burrows ponds and earthen ponds, handles the rearing and the capture of some stocks. The Tsolum project, constructed in 1980, is operated as a satellite from the main site, and is utilized for holding and rearing of Tsolum River pink salmon.

The egg targets (totals) for 1985 were 5 M coho, 1.7 M chinook, 8.3 M chum, 4.5 M pink, 390 K steelhead and 16 K cutthroat. Eggs are obtained from Puntledge River and Tsolum River. Juveniles are released into the Puntledge , Trent and Tsolum watersheds, as well as Comox Bay.

Water Sources:

Surface. Both the upper and lower Puntledge sites utilize pumped Puntledge River water, with a gravity feed acting as backup. The Tsolum project utilizes water gravity fed from Headquarters Creek.

Groundwater. No groundwater is used at any of the sites.

General Water Quality:

Overall the water is of good quality, although it is somewhat soft and supersaturated at times. Electric heaters are used to increase water temperatures up to 6oC above ambient. This heated water is used for incubation, and occasionally for initial rearing in Capilano-style troughs. There is also provision for cooling the water up to 6oC below ambient.

Special Notes:

Upper Puntledge River samples were taken at the intake pump to the upper site. The samples marked with an asterisk were taken before flowing through the pump, those not marked were taken after flowing through the pump. All samples at the lower site were taken in the incubation room. Water temperature records were taken from the upper site. Water temperature records for Headquarters Creek are taken in the creek at the intake.

WATER QUALITY VALUES FOR UPPER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	APR27/77 PUNTLEDGE RIVER*	AUG29/78 PUNT. RIVER*	AUG29/78 PUNT. RIVER	SEP22/78 PUNT. RIVER*	SEP22/78 PUNT. RIVER	OCT12/78 PUNT. RIVER*	OCT12/78 PUNT. RIVER	NOV02/78 PUNT. RIVER*	NOV02/78 PUNT. RIVER	NOV23/78 PUNT. RIVER*	NOV23/78 PUNT. RIVER
Alkalinity	17	17.2	17.2	16.2	17.2	17.2	17.2	17.7	17.7	18.4	18.4
Ammonia	.013					0	.019	0		0	
CO2											
Chloride	0	0		.5	.5	.5	.5	.55	.55	.55	.55
Color											
Conductivity Field											
Conductivity Lab	39.7	36.5	36.5	35.5	35.5	36.2	36.2	37.1	37.1	37.6	37.6
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	17.86	18		16.6	16.6	18.2	18.2	18	18	17	17
Nitrite	0					0		0		0	
Nitrate	.033					.019	.022	.025	.025	.037	.037
pH-Field	7.3	7.5	7.5	7.2	7.2	7.4	7.4	7.3	7.3	7.3	7.3
pH-Lab											
Phosphate	0				.003	0		0		0	.022
Residue Filterable		33	33	28	28	30	30	26	26	29	29
Residue Non-Filter		0		0		0		0		0	
Silica	2	1.75	1.75	2	2	2	2	1.9	1.9	1.9	1.9
Sulphate	1.5	1	1	1.1	1.1	0		1.6	1.6	1.1	1.1
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum											
As-Arsenic											
Ba-Barium											
Ca-Calcium	5.7	5.95	5.95	5.27	5.27	5.83	5.83	5.69	5.69	5.37	5.37
Cd-Cadmium	0	0		0		0		0		0	
Co-Cobalt											
Cr-Chromium											
Cu-Copper	0	0		0		0		0		0	
Fe-Iron		.021	.021	.029	.029	.032	.032	.031	.031	.017	.017
Hg-Mercury		0		0		0		0		0	
K—Potassium	.04	.04	.04	.055	.055	.037	.037	.049	.048	.045	.045
Mg-Magnesium	88	.756	.756	.83	.83	.884	.884	.927	.927	.884	.884
Mn-Manganese											
Mo-Molybdenum											
Na-Sodium	.59	.67	.67	.64	.64	.69	.69	.58	.58	.53	.53
Ni-Nickle											
P—Phosphorus											
Pb-Lead	0	0		0		0		0		0	
Sb-Antimony											
Se-Selenium											
Si-Silicon											
Sn-Tin											
Sr-Strontium											
Ti-Titanium											
V—Vanadium											
Zn-Zinc	.01	0		0		0		0		0	

WATER QUALITY VALUES FOR UPPER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	DEC21/78 PUNTLEDGE RIVER*	DEC21/78 PUNT. RIVER	FEB01/79 PUNT. RIVER*	MAR01/79 PUNT. RIVER*	MAR30/79 PUNT. RIVER*	APR18/79 PUNT. RIVER*	MAY10/79 PUNT. RIVER*	MAY22/79 PUNT. RIVER*	JUN12/79 PUNT. RIVER*	JUL04/79 PUNT. RIVER*	JUL24/79 PUNT. RIVER*
Alkalinity	18.3		17.3	16.6	17.5	18.1	18.1	18.5	18.2	17.7	18.3
Ammonia	0	.048	0	0	0	0	0	0	0	0	0
CO2											
Chloride	.5	.5	0	.7	0	.55	.53	.5	.5	0	0
Color											
Conductivity Field											
Conductivity Lab	38	38	39.5	37.7	38.6	39.2	39.7	39.8	39.1	39.2	38.6
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	19.2	19.2	18.7	16.8	16.4	17.6	17.8	17.9	16.3	16.6	16.6
Nitrite	0		0	0	0	0	0	0	0	0	0
Nitrate	.046	.046	.049	.052	.048	.0438	.039	.037	.038	.027	.022
pH-Field	7.6	7.6	7.1	7.3	7.4	7.4	7.8	7.6	7.5	7.4	7.5
pH-Lab							7.8	7.6	7.5	7.4	7.5
Phosphate	0		0	0	0	0	0	0	0	0	0
Residue Filterable	33	33	24	33	29	34	26	28	33	35	30
Residue Non-Filter	0		0	0	0	0	0	0	0	0	0
Silica	1.8	1.8	2.23	2.2	2.15	2.18	1.8	1.95	1.88	1.78	1.88
Sulphate	1.1	1.1	1.1	1.3	1.1	1.1	1	2.35	0	.93	1
Taste											
Temperature											
Turbidity						0	0	0	0	0	0
METALS—											
Al-Aluminum						0	0	0	0	0	0
As-Arsenic						0	0	0	0	0	0
Ba-Barium						0	0	0	0	0	0
Ca-Calcium	6.02	6.02	5.82	5.39	5.26	5.57	5.61	5.77	5.1	5.05	5.13
Cd-Cadmium	0		0	0	0	0	0	0	0	0	0
Co-Cobalt						0	0	0	0	0	0
Cr-Chromium						0	0	0	0	0	0
Cu-Copper	0		0	0	0	0	0	0	0	0	0
Fe-Iron	0	0	.024	.033	.027	.02	.016	.018	.012	.026	.016
Hg-Mercury	0		0	0	0	0	0	0	0	0	0
K—Potassium	.039	.038	.048	.051	.037	.044	.047	.044	.045	.041	.045
Mg-Magnesium	1.01	1.01	1.01	.815	.799	.908	.916	.841	.874	.979	.918
Mn-Manganese						.0033	0	0	0	0	0
Mo-Molybdenum						0	0	0	0	0	0
Na-Sodium	.6	.6	.57	.63	.6	.49	.53	.54	.24	.44	.52
Ni-Nickle						0	0	0	0	0	0
P—Phosphorus						0	0	0	0	0	0
Pb-Lead	0		0	0	0	0	0	0	0	0	0
Sb-Antimony						0	0	0	0	0	0
Se-Selenium						0	0	0	0	0	0
Si-Silicon						1.99	2.1	1.97	1.72	1.85	1.82
Sn-Tin								0	0	0	0
Sr-Strontium						.0079	.0083	.0085	.007	.0079	.0083
Ti-Titanium						0	0	0	0	0	0
V—Vanadium						0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR UPPER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	AUG14/79 PUNTLEDGE RIVER*	SEP06/79 PUNT. RIVER*	OCT02/79 PUNT. RIVER*	OCT23/79 PUNT. RIVER*	NOV15/79 PUNT. RIVER*	DEC06/79 PUNT. RIVER*	JAN03/80 PUNT. RIVER*	JAN31/80 PUNT. RIVER*	FEB10/80 PUNT. RIVER*	MAR06/80 PUNT. RIVER*	APR14/80 PUNT. RIVER*
Alkalinity	17.9	17.8	17.8	17.1	17.8	16.7	16.7	17.3	18.4	16.9	17.4
Ammonia	0	0	0	0	0	0	0	0	0	0	0
CO2											
Chloride	0	.55	0	.55	.56	.5	.5	.64	.75	.74	.55
Color											
Conductivity Field											
Conductivity Lab	38.7	38.5	38.6	38.7	38.2	38	37.6	39.8	38.3	37.1	39.6
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	17.4	17.4	19.5	18.5	18.2	17.7	17.4	18	16	18.5	20
Nitrite	0	0	0	0	0	0	0	0	0	0	0
Nitrate	.015	.021	.0233	.032	.0424	.043	.06	.0561	.06	.055	.0505
pH-Field	7.3	7.2	7.4	7.1	7.2	7.1	7	7.1	7.4	7.1	7.2
pH-Lab	7.3	7.2	7.4		7.2	7.1	7	7.1		7.1	7.2
Phosphate	0	0	0	0	0	.005	0	0	0	0	0
Residue Filterable	28	33	34	32	30	34	30	31	31	36	35
Residue Non-Filter	0	0	0	0	0	0	0	0	0	0	0
Silica	1.88	1.9	1.68	1.46	1.61	2.18	2.21	2.18	2.1	2.16	2.31
Sulphate	1.2	1.2	3.98	1.2	1.2	1.1	.96	1.3	2.1	2.3	1.5
Taste											
Temperature											
Turbidity	0	0	0	0	1.1	1	1.3	0		0	1.3
METALS—											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0		0	0
Ba-Barium	0	0	0	0	0	0	0	0		0	0
Ca-Calcium	5.46	5.45	6.33	5.85	5.73	5.52	5.44	5.66	5	5.82	6.37
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0		0	0
Cr-Chromium	0	0	0	0	0	0	0	0		0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.028	.012	.014	.027	.054	.031	.07	.031	.026	.042	.029
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K—Potassium	.048	.05	.049	.055	.052	.048	.046	.048	.04	.081	.048
Mg-Magnesium	.925	.915	.903	.936	.934	.941	.93	.93	.8	.953	1
Mn-Manganese	.0048	0	0	0	0	0	0	.0064	.003	.0062	0
Mo-Molybdenum	0	0	0	0	0	0	0	0		0	0
Na-Sodium	.6	.88	.83	.76	.87	.875	.731	.7	6	.734	.682
Ni-Nickle	0	0	0	0	0	0	0	0		0	0
P—Phosphorus	0	0	0	0	0	0	0	0		0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0		0	0
Se-Selenium	0	0	0	0	0	0	0	0		0	0
Si-Silicon	1.78	1.95	1.75	2.05	1.47	1.52	2.27	2.13		2.04	1.99
Sn-Tin	0	0	0	0	0	0	0	0		0	0
Sr-Strontium	.0083	.0076	.0075	.0081	.0082	.0088	.0073	.0077		.0078	.0074
Ti-Titanium	0	0	0	0	0	0	0	0		0	0
V—Vanadium	0	0	0	0	0	0	0	0		0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR UPPER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	MAY05/80 PUNTLEDGE RIVER*	MAY26/80 PUNT. RIVER*	JUN17/80 PUNT. RIVER*	JUL08/80 PUNT. RIVER*	JUN23/82 PUNT. RIVER	JUN23/82 PUNT. RIVER	JUL07/82 PUNT. RIVER	JUL07/82 PUNT. RIVER	JUL22/82 PUNT. RIVER	JUL22/82 PUNT. RIVER	AUG04/82 PUNT. RIVER
Alkalinity	17.6	17.5	17.9	17.5							
Ammonia	0	0	0	0							
CO2											
Chloride	0	.57	.57	0							
Color											
Conductivity Field											
Conductivity Lab	38.1	39.7	38.3	37.4							
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	19.2	19.2	17.4	17.1	15.9	5.8	5.8	5.8	16.2	16.1	15.4
Nitrite	0	0	0	0							
Nitrate	.0433	.0357	.0246	.0312							
pH-Field	7.3	7.3	7.2	7.3							
pH-Lab	7.3	7.3	7.2								
Phosphate	0	0	0	0							
Residue Filterable	31	25	28	29							
Residue Non-Filter	0	0	0	0							
Silica	2.16	2.15	2.87	2.16							
Sulphate	1.4	1.85	1.2	1.1							
Taste											
Temperature											
Turbidity	0	0	0								
METALS—											
Al-Aluminum	0	0	0		0	0	0	0	0	0	0
As-Arsenic	0	0	0		0	0	0	0	0	0	0
Ba-Barium	0	0	0		0	0	0	0	0	0	0
Ca-Calcium	6.08	6.28	5.54	5.46	5	5	4.9	4.9	5.1	5	5
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0		0	0	0	0	0	0	0
Cr-Chromium	0	0	0		0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.036	.01	.015	.014	.02	.019	.018	.016	.025	.022	.01
Hg-Mercury	0	0	0		0	0	0	0	0	0	0
K—Potassium	.045	.046	.048	.059							
Mg-Magnesium	.967	.865	.858	.83	.8	.8	.8	.8	.9	.8	.7
Mn-Manganese	.002	0	.0344		.002	.002	.002	.002	.002	.002	.003
Mo-Molybdenum	0	0	0		0	0	0	0	0	0	0
Na-Sodium	.673	.575	.637	.594	.8	.8	.6	2	.6	.6	.6
Ni-Nickle	0	0	0		0	0	0	0	0	0	0
P—Phosphorus	0	0	0		0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0		0	0	0	0	0	0	0
Se-Selenium	0	0	0		0	0	0	0	0	0	0
Si-Silicon	2.16	2.13	2.04		1.9	1.8	1.8	1.8	1.8	1.8	1.6
Sn-Tin	0	0	0		0	0	0	0	0	0	0
Sr-Strontium	.0081	.0083	.0071		.007	.008	.007	.007	.007	.007	.007
Ti-Titanium	0	0	0		0	0	0	0	0	0	0
V—Vanadium	0	0	0		0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR UPPER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	AUG04/82 PUNTLEDGE RIVER	AUG18/82 PUNT. RIVER	AUG18/82 PUNT. RIVER	SEP01/82 PUNT. RIVER	SEP01/82 PUNT. RIVER	SEP29/82 PUNT. RIVER	SEP29/82 PUNT. RIVER	OCT13/82 PUNT. RIVER	OCT13/82 PUNT. RIVER	OCT27/82 PUNT. RIVER	OCT27/82 PUNT. RIVER
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	15.7	15.7	15.6	16.4	16.5	15.2	14.8	16.6	18.8	17	16.9
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	0	0	0	0	0	0	0	0	.06	.18	.17
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	0	0	0	0	0	0	0	0	0
Ca-Calcium	5	5	4.9	5.4	5.4	5.1	.51	5.3	5.3	5	5
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	.023	0	0	0
Fe-Iron	.01	.02	.019	.025	.034	0	0	.126	.007	.142	.143
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K—Potassium											
Mg-Magnesium	.7	.7	.7	.7	.7	.7	.7	.8	.8	.8	.8
Mn-Manganese	.002	.007	.004	.004	.004	0	0	.003	.003	.007	.007
Mo-Molybdenum	0	0	0	.7	.7	0	0	0	0	0	0
Na-Sodium	.6	.8	.6	.6	.6	.7	.7	.6	.6	.7	.7
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	.14	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	1.6	1.6	1.6	1.7	1.7	1.6	1.6	1.7	1.7	1.9	1.9
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.007	.007	.007	.008	.008	.007	.007	.008	.008	.004	.004
Ti-Titanium	0	0	0	0	0	0	0	0	0	.003	.003
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	.025	0	0	0

WATER QUALITY VALUES FOR UPPER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	NOV24/82 PUNTLEDGE RIVER	NOV24/82 PUNT. RIVER	DEC08/82 PUNT. RIVER	DEC08/82 PUNT. RIVER	JAN19/83 PUNT. RIVER	JAN19/83 PUNT. RIVER	FEB03/83 PUNT. RIVER	FEB03/83 PUNT. RIVER	FEB23/83 PUNT. RIVER	FEB23/83 PUNT. RIVER	MAR16/83 PUNT. RIVER
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	14.3	14.2	16.3	16.5	16.3	16.3	18.3	16.3	17	17.1	15.7
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	0	0	0		0	0	0	0	0	0	0
As-Arsenic	0	0	0		0	0	0	0	0	0	0
Ba-Barium	0	0	0		0	0	.001	.001	0	0	0
Ca-Calcium	4.3	4.3	5.1	5.1	5.1	5.1	5.1	5.1	5.2	5.2	4.9
Cd-Cadmium	0	0	0		0	0	0	0	0	0	0
Co-Cobalt	0	0	0		0	0	0	0	0	0	0
Cr-Chromium	0	0	0		0	0	0	0	0	0	0
Cu-Copper	0	0	0		0	0	0	0	0	0	0
Fe-Iron	.029	.029	.037	.037	.035	.038	.025	.025	.042	.042	.037
Hg-Mercury	0	0	0		0	0	0	0	0	0	0
K—Potassium					.06	.06	.05	.05	.06	.06	.04
Mg-Magnesium	.8	.8	.8	.8	.9	.9	.8	.8	.9	.9	.8
Mn-Manganese	0	0	0	0	.002	.002	.002	.002	.002	.003	.002
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	.3	.3	.3	.3	.6	.6	.7	.7	.7	.7	.7
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	1.9	1.9	.2	.2	2.1	2.1	2.1	2.1	2.3	2.3	2.1
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.007	.007	.008	.007	.007	.007	.007	.007	.008	.008	.008
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	.003
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.006	0	0	0	0	0	0	0	0	0	0
					0	0	0	0	0	0	.003
					0	0	0	0	0	0	0

WATER QUALITY VALUES FOR UPPER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	MAR16/83 PUNTLEDGE RIVER	APR06/83 PUNT. RIVER	APR06/83 PUNT. RIVER	APR20/83 PUNT. RIVER	APR20/83 PUNT. RIVER	MAY25/83 PUNT. RIVER	MAY25/83 PUNT. RIVER	DEC07/83 PUNT. RIVER	DEC07/83 PUNT. RIVER	JAN04/84 PUNT. RIVER	JAN04/84 PUNT. RIVER
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	15.9	16.5	16.3	16.6	16.9	15.7	15.7	16.9	16.7	14.2	14.3
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	0	0	0	0	0	0	0	0	0
Ca-Calcium	4.9	5.1	5.1	5.2	5.2	4.9	4.9	5.3	5.3	4.3	4.4
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.037	.023	.023	.018	.019	.028	.029	.024	.023	.035	.035
Hg-Mercury	0	0	0	0	0						
K—Potassium	.04	.06	.05	.06	.06						
Mg-Magnesium	.8	.8	.8	.8	.9	.8	.8	.6	.8	.8	.8
Mn-Manganese	.003	.002	.002	.003	.003	.003	.003	.004	.004	.003	.003
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	.7	.7	.7	.7	.7	.6	.6	.7	.7	.7	.7
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	2.1	2.1	2.1	2.1	2.1	2	2	2	2	2.3	2.3
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.008	.008	.008	.008	.008	.007	.007	.008	.008	.007	.007
Ti-Titanium	.003	0	0	0	0	0	0	0	0	.003	.003
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	.003	0	0	0	0	0	.031	.03	0	0

WATER QUALITY VALUES FOR UPPER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	FEB15/84 PUNTLEDGE RIVER	FEB15/84 PUNT. RIVER	APR11/84 PUNT. RIVER	APR11/84 PUNT. RIVER	MAY23/84 PUNT. RIVER	MAY23/84 PUNT. RIVER	JUN13/84 PUNT. RIVER	JUN13/84 PUNT. RIVER	JUL13/84 PUNT. RIVER	JUL13/84 PUNT. RIVER	AUG21/84 PUNT. RIVER
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	14.6	14.5	16.7	16.5	16.2	16.2	17	16.7	17	16.6	16.1
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	0	0	0	0	0	0	0	0	0
Ca-Calcium	4.5	4.5	5.3	5.2	5	5.1	5.4	5.3	5.4	5.3	5.1
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.039	.04	.018	.017	.017	.013	0	0	.02	.011	.014
Hg-Mercury											
K—Potassium											
Mg-Magnesium	.8	.8	.6	.8	.8	.8	.9	.8	.8	.6	.8
Mn-Manganese	.002	.002	.002	.004	0	0	.003	.003	.002	.002	.002
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	.6	.6	.7	.7	.7	.7	.6	.6	.7	.7	.6
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	1.9	1.9	2.2	2.2	1.9	1.9	2.2	2.1	2	2	1.8
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.007	.006	.007	.006	.009	.008	.007	.007	.008	.088	.009
Ti-Titanium	.004	.003	0	0	0	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR UPPER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	AUG21/84 PUNTLEDGE RIVER	SEP12/84 PUNT. RIVER	SEP12/84 PUNT. RIVER	OCT16/84 PUNT. RIVER	OCT16/84 PUNT. RIVER	NOV06/84 PUNT. RIVER	NOV06/84 PUNT. RIVER	DEC19/84 PUNT. RIVER	DEC19/84 PUNT. RIVER	JAN15/85 PUNT. RIVER	JAN15/85 PUNT. RIVER
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	16.1	16	16.4	15.8	15.5	16.8	16.9	16.7	16.7	17.1	17.1
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	0	0	0	.05	0	.06	.08	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	0	0	0	0	0	0	0	0	0
Ca-Calcium	5.1	5.1	5.1	4.8	4.8	4.9	4.9	5.1	5.2	5.4	5.3
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.015	.019	.019	.045	.045	.042	.044	.034	.034	.017	.015
Hg-Mercury											
K—Potassium											
Mg-Magnesium	.8	.8	.8	.8	.8	1	1	.9	.9	.9	.9
Mn-Manganese	.003	.003	.003	.003	.003	.003	.003	.003	.003	.003	.003
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	.006	.007
Na-Sodium	.6	.7	.7	.6	.6	.7	.7	.6	.7	.7	.7
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	.05	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	1.8	1.8	1.8	1.9	1.9	2.2	2.2	2	2	1.4	1.4
Sn-Tin	0	0	0	.1	.11	0	.01	0	0	0	0
Sr-Strontium	.007	.007	.007	.007	.007	.006	.006	.007	.007	.008	.008
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR UPPER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	JUN12/85 PUNTLEDGE RIVER	JUN12/85 PUNT. RIVER
Alkalinity		
Ammonia		
CO2		
Chloride		
Color		
Conductivity Field		
Conductivity Lab		
Dissolved O2-ppm		
Dissolved O2-%sat		
Dissolved Gas Tot		
Dissolved Nitrogen		
Hardness	9.96	10
Nitrite		
Nitrate		
pH-Field		
pH-Lab		
Phosphate		
Residue Filterable		
Residue Non-Filter		
Silica		
Sulphate		
Taste		
Temperature		
Turbidity		
METALS—		
Al-Aluminum	.05	.05
As-Arsenic	0	0
Ba-Barium	0	0
Ca-Calcium	2.7	2.7
Cd-Cadmium	0	0
Co-Cobalt	0	0
Cr-Chromium	0	0
Cu-Copper	0	0
Fe-Iron	.082	.083
Hg-Mercury		
K—Potassium		
Mg-Magnesium	.7	.7
Mn-Manganese	.008	.008
Mo-Molybdenum	0	0
Na-Sodium	.6	.6
Ni-Nickle	0	0
P—Phosphorus	0	0
Pb-Lead	0	0
Sb-Antimony	0	0
Se-Selenium	0	0
Si-Silicon	1.2	1.2
Sn-Tin	0	0
Sr-Strontium	.006	.006
Ti-Titanium	0	0
V—Vanadium	0	0
Zn-Zinc	.018	.021

WATER QUALITY VALUES FOR LOWER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	MAY22/79 INCU-BATION	DEC06/79 INCU-BATION	FEB10/81 INCU-BATION	MAY06/81 INCU-BATION	MAY28/81 INCU-BATION	FEB10/82 INCU-BATION	FEB10/82 INCU-BATION	MAR17/82 INCU-BATION	MAR17/82 INCU-BATION	MAR31/82 INCU-BATION	MAR31/82 INCU-BATION
Alkalinity	16.4	17.9		17.1	17.7	17.9		16		17	
Ammonia	0	0		0	0	0		0		0	
CO2											
Chloride	0	.82		0	.81	1.09		1.23		.8	
Color											
Conductivity Field											
Conductivity Lab	0	45.5		38.8	38.4	39		38.8		38.5	
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	17.5	20.6	15.3	16.3	15.8	17.2	16.4	16.7	16.6	17.2	17.1
Nitrite	0	0		0	0	0		0		0	
Nitrate	.045	.0515		.051	.031	.06		.05		.053	
pH-Field	7.6	7.1		7.4	7.5	7.4		7.3		7.5	
pH-Lab	7.6	7.1				7.4		7.3			
Phosphate	0	0		0				0		0	
Residue Filterable	33	39		29	26	37		40		31	
Residue Non-Filter	0	0		0	0	0		0		0	
Silica	1.9	2.3	2.21	2.16	2.13	2.1		1.7		2.2	
Sulphate	1	2.6		1.4	2.1	2.3		2.3		2.6	
Taste											
Temperature									6.3		
Turbidity	0	1.2				0		.2		.6	
METALS—											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0			0	0	0	0	0	0
Ba-Barium	0	0				0	0	0	0	0	0
Ca-Calcium	5.63	6.14	4.78	5.13	4.98	5.4	5.1	5.2	5.2	5.4	5.3
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0			0	0	0	0	0	0
Cr-Chromium	0	0	0			0	0	0	0	0	0
Cu-Copper	.0037	0	.0014	0	0	0	0	0	0	0	0
Fe-Iron	.019	.038	.071	.0233	.0165	.027	.029	.034	.027	.032	.027
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K—Potassium	.052	.061		.044	.041	.04	.04	.05	.05	.05	.05
Mg-Magnesium	.838	1.27	.817	.85	.81	.9	.9	.8	.8	.9	.9
Mn-Manganese	0	.0082	.0063	.0029	.0019	.003	.003	.002	.002	.002	.002
Mo-Molybdenum	0	0	0			0	0	0	0	0	0
Na-Sodium	.53	.925	.798	.73	.71	.7	.7	.7	.7	.7	.7
Ni-Nickle	0	0	0			0	0	0	0	0	0
P—Phosphorus	0	0				0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0			0	0	0	0	0	0
Se-Selenium	0	0	0			0	0	0	0	0	0
Si-Silicon	2	1.83	2.21			2.2	2.2	2.2	2.1	2.2	2.2
Sn-Tin	0	0	0			0	0	0	0	0	0
Sr-Strontium	.008	.0111	.0082			.007	.007	.007	.007	.008	.008
Ti-Titanium	0	0	0			0	0	0	0	0	0
V—Vanadium	0	0	0			0	0	0	0	0	0
Zn-Zinc	.0046	0	.0019	.0014	.0048	.032	.002	0	0	0	0

WATER QUALITY VALUES FOR LOWER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	APR14/82 INCU-BATION	APR14/82 INCU-BATION	APR28/82 INCU-BATION	APR28/82 INCU-BATION	MAY12/82 INCU-BATION	MAY12/82 INCU-BATION	MAY26/82 INCU-BATION	MAY26/82 INCU-BATION	JUN08/82 INCU-BATION	JUN08/82 INCU-BATION	JUN23/82 INCU-BATION
Alkalinity	16		16.5		16		17		18.5		
Ammonia	0		0						0		
CO2											
Chloride	.8		.7		.8		.5		.9		
Color											
Conductivity Field											
Conductivity Lab	37.7		38.4		36.9		38		37.4		
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	16.5	16.7	16.9	17.1	17.1	17	17.7	17.6	17.6	17.8	15.8
Nitrite	0		0		0		.008		0		
Nitrate	.05		.05		.04		.04		.04		
pH-Field	7.4		7.4								
pH-Lab	7.4		7.4		7.5		7.3	7.3	7.4		
Phosphate	.005		0		0		0		0		
Residue Filterable	29		29		27		25		37		
Residue Non-Filter	0		0		0		0		0		
Silica	2		2.2		2.1		1.8		2.1		1.9
Sulphate	2.2		2		2.1		2.4		2.7		
Taste											
Temperature											
Turbidity	.1		.4		0		.4		.3		
METALS—											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	0	0	0	0	0	0	0	0	0
Ca-Calcium	5.1	5.2	5.3	5.3	5.3	5.3	5.5	5.5	5.5	5.5	4.9
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.022	.022	.022	.022	.02	.018	.016	.016	.033	.033	.024
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K--Potassium	.05	.05	.04		.05	.052	.05	.05	.044	.041	.041
Mg-Magnesium	.9	.9	.9	.9	.9	.838	.9	.9	.9	.81	.8
Mn-Manganese	.001	.001	.002	.002	.003	.002	.002	.002	.003	.0019	.002
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	.7	.7	.7	.7	.7	.53	.8	.8	.7	.71	.6
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	2.2	2.2	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	1.9
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.009	.009	.007	.007	.008	.008	.008	.008	.008	.008	.008
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V--Vanadium	0	0		0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	.0046	0	0	.0014	.0048	.0015

WATER QUALITY VALUES FOR LOWER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	JUN23/82 INCU-BATION	JUL07/82 INCU-BATION	JUL07/82 INCU-BATION	JUL22/82 INCU-BATION	JUL22/82 INCU-BATION	AUG04/82 INCU-BATION	AUG04/82 INCU-BATION	SEP01/82 INCU-BATION	SEP01/82 INCU-BATION	SEP29/82 INCU-BATION	OCT13/82 INCU-BATION
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	15.7	16.2	16.1	16.1	16.2	15.9	15.5	17.2	16.5	15.3	16.7
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica		1.8									
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	0	.08	.07	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	0	0	0	.002	.002	0	0	.043	0
Ca-Calcium	4.9	4.9	4.9	5.1	5.1	5.1	5	5.6	5.3	5.2	5.4
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.023	.064	.058	.039	.027	.016	.015	.087	.026	0	.01
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K—Potassium	.04	.05	.05								
Mg-Magnesium	.9	.8	.8	.8	.8	.7	.7	.8	.8	.7	.8
Mn-Manganese	.003	.01	.008	.002	.002	.002	.002	.005	.04	0	.003
Mo-Molybdenum	0	0	0	0	0			0	0	0	0
Na-Sodium	.7	.7	.6	.6	.6	.7	.7	.6	.6	.7	.6
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	1.9	1.8	1.8	1.8	1.8	1.6	1.6	1.7	1.8	1.6	1.8
Sn-Tin	0	0	0	0	.01	0		0	0	0	0
Sr-Strontium	.007	.007	.007	.007	.007	.009	.01	.008	.008	.007	.008
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.032	.003	.002	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR LOWER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	OCT13/82 INCUBATION	OCT27/82 INCUBATION	OCT27/82 INCUBATION	NOV24/82 INCUBATION	NOV24/82 INCUBATION	DEC08/82 INCUBATION	DEC08/82 INCUBATION	JAN19/83 INCUBATION	JAN19/83 INCUBATION	FEB03/83 INCUBATION	FEB23/83 INCUBATION
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	16.3	17.3	18	14.5	14.5	16.7	16.7	16.3	16.3	16.8	16.6
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	0	.19	.22	0	.05	0	0	0	0	0	.05
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.008	0	0	0	0	0	0	0	0	.001	0
Ca-Calcium	5.3	5.1	5.2	4.4	4.4	5.2	5.2	5.1	5.1	5.2	5.1
Cd-Cadmium	0	0	0	0	0	0	0	0	.008	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.012	.195	.224	.035	.038	.039	.038	.039	.036	.029	.077
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K—Potassium								.06	.06	.05	.06
Mg-Magnesium	.8	.8	.8	.8	.8	.8	.8	.8	.8	.9	.8
Mn-Manganese	.003	.01	.01	0	0	0	0	.002	.002	.003	.004
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	.6	.7	.7	.4	.3	.3	.3	.7	.7	.8	.7
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	1.7	1.9	2	1.9	1.9	.2	.2	2.1	2.1	2.1	2.2
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.008	.005	.005	.007	.007	.008	.007	.007	.007	.008	.008
Ti-Titanium	0	.003	.005	0	0	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	.003	0	0	0	0	.005	0	.01	0

WATER QUALITY VALUES FOR LOWER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	FEB23/83 INCUBATION	MAR16/83 INCUBATION	MAR16/83 INCUBATION	APR06/83 INCUBATION	APR06/83 INCUBATION	APR20/83 INCUBATION	APR20/83 INCUBATION	MAY04/83 INCUBATION	MAY04/83 INCUBATION	MAY25/83 INCUBATION	MAY25/83 INCUBATION
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	16.9	16.2	15.9	16.3	16	16.4	16.4	17.5	17.1	16.5	16.5
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	.07	0	0	0	0	0	0	.09	.07	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	0	0	0	0	0	0	0	0	0
Ca-Calcium	5.1	5	5	5.1	5	5.1	5.2	5.2	5.2	5.2	5.2
Cd-Cadmium	0	0	0	.002	.001	.0013	.0005	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	.002	0	0	0	0	0	0
Fe-Iron	.077	.043	.042	.028	.029	.021	.019	.089	.093	.037	.036
Hg-Mercury	0	0	0	0	0	0	0				
K—Potassium	.06	.04	.04	.05	.05	.06	.05				
Mg-Magnesium	.9	.8	.8	.8	.8	.8	.8	.9	.8	.8	.8
Mn-Manganese	.004	.003	.003	.002	.002	.002	.002	.004	.004	.004	.004
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	.7	.7	.7	.7	.7	.7	.7	.7	.7	.7	.6
Ni-Nickle	0	0	0	.02	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	2.3	2.1	2	2.1	2.1	2	2	2.1	2	2	2
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008	.008
Ti-Titanium	0	.003	.003	.002	0	0	0	.005	.005	.008	.008
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	.004	.002	.003	.002	.091	.01	.039	.041

WATER QUALITY VALUES FOR LOWER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	JUN08/83 INCU-BATION	JUN08/83 INCU-BATION	JUN22/83 INCU-BATION	JUN22/83 INCU-BATION	JUL06/83 INCU-BATION	JUL06/83 INCU-BATION	AUG03/83 INCU-BATION	AUG03/83 INCU-BATION	AUG17/83 INCU-BATION	AUG17/83 INCU-BATION	SEP01/83 INCU-BATION
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	15.6	15.7	17	15.7	15.6	16.4	16.1	15.1	15.3	15.3	15.6
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	0	0	0	0	0	0	0	.05	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	0	0	0	0	0	0	0	0	0
Ca-Calcium	4.9	4.9	5.3	5	5.3	5.3	4.7	4.7	4.9	4.9	4.9
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.016	.017	.015	.014	.014	.013	.026	.026	.021	.018	.026
Hg-Mercury											
K—Potassium											
Mg-Magnesium	.8	.8	.9	.8	.8	.8	.1	.8	.7	.7	.7
Mn-Manganese	.002	.002	.004	.002	.002	.002	.003	.002	.003	.016	.004
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	.6	.6	1.1	.6	.7	.7	.5	.5	.6	.7	.7
Ni-Nickle	0	0	0	0	0	0	0	0	0	.02	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	1.9	1.9	1.9	1.8	1.8	1.8	1.6	1.6	1.7	1.7	1.8
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.008	.008	.009	.007	.007	.007	.008	.008	.008	.007	.007
Ti-Titanium	.008	.008	0	0	0	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	.005	.017	0	0	0	0	0	0	.008

WATER QUALITY VALUES FOR LOWER PUNTLEDGE
[below detection limits = 0]

PARAMETERS	SEP01/83 INCU-BATION	SEP14/83 INCU-BATION	SEP14/83 INCU-BATION	OCT03/83 INCU-BATION	OCT03/83 INCU-BATION	OCT12/83 INCU-BATION	OCT12/83 INCU-BATION	OCT26/83 INCU-BATION	OCT26/83 INCU-BATION	NOV08/83 INCU-BATION	NOV08/83 INCU-BATION
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	15.5	16.4	16	16	15.9	16.3	16.2	15.7	15.6	15.5	15.4
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	0	0	0	.001	.001	0	0	0	0
Ca-Calcium	5	5	5.2	5.2	4.9	5.2	5.2	4.9	4.9	4.8	4.9
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	.079	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.019	.02	.017	.019	.02	.023	.021	.039	.037	.031	.029
Hg-Mercury											
K—Potassium											
Mg-Magnesium	.7	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8
Mn-Manganese	.004	.003	.003	.003	.003	.004	.003	.004	.004	.003	.003
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	
Na-Sodium	.7	.7	.7	.7	1.4	1.1	1.3	.7	.7	.7	.7
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.9	1.9	1.9	1.9
Sn-Tin	0	0	0	0	0	0	0	0	0	.01	0
Sr-Strontium	.007	.007	.007	.008	.008	.008	.008	.007	.007	.007	.007
Ti-Titanium	0	0	0	0	0	0	0	.002	0	.002	.002
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.03	0	0	0	.025	.005	.024	0	0	0	0

WATER QUALITY VALUES FOR LOWER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	NOV24/83 INCUBATION	NOV24/83 INCUBATION	DEC07/83 INCUBATION	DEC07/83 INCUBATION	DEC21/83 INCUBATION	DEC21/83 INCUBATION	JAN04/84 INCUBATION	JAN04/84 INCUBATION	JAN17/84 INCUBATION	JAN17/84 INCUBATION	FEB01/84 INCUBATION
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	15.3	15.3	15.8	15.7	15.9	15.5	15.1	14.9	16.1	16.1	16.4
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	.05	.06	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	0	0	0	0	0	0	0	0	0
Ca-Calcium	4.7	4.7	4.8	4.9	5	4.9	4.7	4.7	5	5	5.1
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.049	.056	.031	.031	.02	.02	.027	.028	.038	.036	.028
Hg-Mercury											
K—Potassium											.06
Mg-Magnesium	.9	.8	.9	.8	.8	.7	.8	.7	.8	.8	.8
Mn-Manganese	.003	.004	.003	.003	.003	.003	.003	.003	.002	.002	.002
Mo-Molybdenum							0	0	0	0	0
Na-Sodium	.7	.7	.7	.7	.7	.7	.7	.6	.7	.6	.6
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	2.1	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.008	.008	.007	.007	.009	.009	.007	.007	.007	.008	.009
Ti-Titanium	.003	.003	0	0	0	0	.002	.002	.003	.004	.003
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR LOWER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	FEB01/84 INCU-BATION	FEB15/84 INCU-BATION	FEB15/84 INCU-BATION	FEB29/84 INCU-BATION	FEB29/84 INCU-BATION	APR11/84 INCU-BATION	APR11/84 INCU-BATION	MAY23/84 INCU-BATION	MAY23/84 INCU-BATION	JUN13/84 INCU-BATION	JUN13/84 INCU-BATION
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	16.3	14.7	14.7	16.1	16.2	16.8	16.5	16.5	16	16.6	16.4
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	0	0	0	.05	0	0	0	6	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	0	0	0	0	0	0	0	0	0
Ca-Calcium	5.1	4.6	4.6	4.9	5	5.2	5.2	5.1	5.1	5.2	5.2
Cd-Cadmium	0	0	0	0	0	0	0	.003	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.028	.040	.042	.058	.065	.024	.023	.018	.016	0	0
Hg-Mercury											
K—Potassium	.03										
Mg-Magnesium	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8	.8
Mn-Manganese	.002	.002	.002	.003	.003	.002	.002	0	0	.003	.002
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	.6	.8	.6	.8	.8	.7	.7	.7	.7	.8	.6
Ni-Nickle	0	.02	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	2.2	1.9	1.9	2.2	2.3	2.2	2.2	1.9	1.8	2.1	2.1
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.009	.007	.008	.008	.008	.008	.008	.008	.008	.007	.007
Ti-Titanium	.003	.006	.003	.004	.003	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR LOWER PUNTLEDGE

(below detection limits = 0)

PARAMETERS	JUL13/84 INCU-BATION	JUL13/84 INCU-BATION	AUG21/84 INCU-BATION	AUG21/84 INCU-BATION	SEP13/84 INCU-BATION	SEP13/84 INCU-BATION	OCT16/84 INCU-BATION	OCT16/84 INCU-BATION	NOV06/84 INCU-BATION	NOV06/84 INCU-BATION	DEC19/84 INCU-BATION
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	17.1	16.8	15.7	16	16.1	16.4	14.2	14.1	15.3	16.2	16.9
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	0	0	0	0	0	0	.08	.07	.1	.06	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	0	0	0	0	0	0	0	0	0
Ca-Calcium	5.4	5.3	5	5.1	5.1	5.2	4.2	4.2	4.5	4.9	5.2
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.015	.012	.012	.012	.02	.021	.07	.089	.036	.037	.027
Hg-Mercury											
K—Potassium											
Mg-Magnesium	.8	.8	.8	.8	.8	.8	.8	.8	1	1	.9
Mn-Manganese	.002	.002	.003	.002	.003	.003	.002	.002	.002	.003	.002
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	.7	.7	.6	.8	.7	.7	.8	.6	.7	.7	.7
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	.06
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	2	2	1.8	1.8	1.8	1.8	2.3	2.3	1.9	2.1	1.9
Sn-Tin	.01	.01	0	0	0	.11	0	.04	.02	0	0
Sr-Strontium	.008	.008	.007	.008	.007	.007	.009	.009	.007	.008	.007
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR LOWER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	DEC19/84 INCU-BATION	JAN15/85 INCU-BATION	JAN15/85 INCU-BATION	FEB12/85 INCU-BATION	FEB12/85 INCU-BATION	MAR13/85 INCU-BATION	MAR13/85 INCU-BATION	APR10/85 INCU-BATION	APR10/85 INCU-BATION	MAY15/85 INCU-BATION	MAY15/85 INCU-BATION
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	16.7	17.1	17.1	17.2	17.2	17.5	17.4	17.5	17.8	19.1	19.2
Nitrite											
Nitrate											
pH-Field				7.28	7.28						
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature		4.9	4.9	4.3	4.3	5.5	5.5	7.8	7.8	9.9	9.9
Turbidity											
METALS—											
Al-Aluminum	0	0	0	0	0	0	0	0	0	.07	.05
As-Arsenic	0	0	0			0	0	0	0	0	0
Ba-Barium	0	0	0			0	0	0	0	0	0
Ca-Calcium	5.1	5.4	5.3			5.4	5.4	5.3	5.5	5.9	6
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0			0	0	0	0	0	0
Cr-Chromium	0	0	0			0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.032	.017	.015	.022	.022	.029	.029	.062	.065	.024	.026
Hg-Mercury											
K—Potassium											
Mg-Magnesium	.9	.8	.9	.9	.9	.9	.9	.9	.9	1	.9
Mn-Manganese	.002	.003	.003	.003	.003	.004	.004	.005	.005	.004	.004
Mo-Molybdenum	0	.006	.007			0	0	0	0	0	0
Na-Sodium	.7	.7	.7	.8	.8	.7	.8	1	.9	.7	.7
Ni-Nickle	0	0	0			0	0	0	0	0	0
P—Phosphorus	.05	0	0			0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0			0	0	0	0	0	0
Se-Selenium	0	0	0			0	0	0	0	0	0
Si-Silicon	1.9	1.4	1.4	.4	.4	2.2	2.2	2.3	2.3	2.2	2.2
Sn-Tin	0	0	0			0	0	0	0	0	0
Sr-Strontium	.007	.008	.008			.008	.008	.009	.009	.008	.008
Ti-Titanium	0	0	0			0	0	0	0	0	0
V—Vanadium	0	0	0			0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR LOWER PUNTLEDGE
(below detection limits = 0)

PARAMETERS	JUN06/85 INCU-BATION	JUN06/85 INCU-BATION	OCT09/85 INCU-BATION	OCT09/85 INCU-BATION	DEC09/85 INCU-BATION	DEC09/85 INCU-BATION	FEB24/86 INCU-BATION	FEB24/86 INCU-BATION
Alkalinity								
Ammonia								
CO2								
Chloride								
Color								
Conductivity Field								
Conductivity Lab								
Dissolved O2-ppm								
Dissolved O2-%sat								
Dissolved Gas Tot								
Dissolved Nitrogen								
Hardness	17.4	16.5	16.9	17.4	17.8	18	17.3	17.5
Nitrite								
Nitrate								
pH-Field								
pH-Lab								
Phosphate								
Residue Filterable								
Residue Non-Filter								
Silica								
Sulphate								
Taste								
Temperature								
Turbidity								
METALS—								
Al-Aluminum	0	0	0	0	.05	.05	.07	.08
As-Arsenic	0	0			0	0	0	0
Ba-Barium	0	0			0	0	0	0
Ca-Calcium	5.6	5.4			5.4	5.4	5.2	5.3
Cd-Cadmium	0	0	0	0	0	0	0	0
Co-Cobalt	0	0			0	0	0	0
Cr-Chromium	0	0			0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0
Fe-Iron	.013	.011	.021	.022	.043	.046	.129	.127
Hg-Mercury								
K—Potassium								
Mg-Magnesium	.8	.7	.8	.9	.9	1	.9	.9
Mn-Manganese	.003	.002	.003	.003	.003	.003	.004	.004
Mo-Molybdenum	0	0			0	0	0	0
Na-Sodium	.6	.6	.7	.7	.8	.9	.7	.7
Ni-Nickle	0	0			0	0	0	0
P—Phosphorus	0	0			0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0
Sb-Antimony	0	0			0	0	0	0
Se-Selenium	0	0			0	0	0	0
Si-Silicon	1.6	1.9	1.3	1.3	1.8	1.8	1.9	1.9
Sn-Tin	.01	.03			0	0	0	0
Sr-Strontium	.007	.007			.009	.009	.008	.009
Ti-Titanium	0	0			0	0	.008	.008
V—Vanadium	0	0			0	0	0	0
Zn-Zinc	.018	.005	0	0	0	0	0	0

WATER QUALITY VALUES FOR TSOLUM SATELLITE
(below detection limits = 0)

PARAMETERS	FEB10/82 HEADQUARTERS CREEK	FEB10/82 HEADQ. CREEK	MAR17/82 HEADQ. CREEK	MAR17/82 HEADQ. CREEK	MAR31/82 HEADQ. CREEK	MAR31/82 HEADQ. CREEK	APR14/82 HEADQ. CREEK	APR14/82 HEADQ. CREEK	APR28/82 HEADQ. CREEK	APR28/82 HEADQ. CREEK	MAY12/82 HEADQ. CREEK
Alkalinity	10.4		10		10		9		9		9
Ammonia	0		0		0		0		.005		
CO2											
Chloride	1.14		1.46		1.2		1		1		1.1
Color											
Conductivity Field											
Conductivity Lab	29		28.2		28.2		28.3		29		28.5
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	10.5	10.5	10.2	10.4	11	10.9	10.6	10.6	11.4	10.7	10.9
Nitrite	0		0		0		0		0		.005
Nitrate	.12		.06		.061		.06		.04		.01
pH-Field	7.1		7.1		7.4		7.3		7.4		7.4
pH-Lab	7.1		7.1		7.4		7.3		7.4		7.4
Phosphate	0		0		.005		0		.005		0
Residue Filterable	36		34		28		25		24		19
Residue Non-Filter	0		0		0		0		0		0
Silica	2.1		1.5		2		1.8		2		1.8
Sulphate	4		2.9		3.6		3.2		3		3.1
Taste											
Temperature											
Turbidity	1.8		.2		.6		.5		.1		.2
METALS—											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	.05
As-Arsenic	0	0	0	0	.05	.06	0	0	0	0	0
Ba-Barium	0	0	0	0	0	0	0	0	.001	0	0
Ca-Calcium	3.1	3.1	3	3.1	3.2	3.2	3.1	3.1	3.4	3.2	3.3
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.064	.062	.058	.061	.081	.075	.069	.066	.054	.044	.047
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K—Potassium	.11	.11	.11	.11	.11	.11	.11	.11	.11		.13
Mg-Magnesium	.6	.6	.5	.6	.6	.6	.6	.6	.8	.6	.6
Mn-Manganese	.003	.003	.003	.002	.004	.003	.003	.003	.005	.003	.004
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	1.2	1.1	1.1	1.1	1.1	1.1	1.1	1.1	1.3	1.1	1
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	2.2	2.2	1.9	2	2	2	2	2	1.9	1.9	1.8
Sn-Tin	0		0	0	0	0	0	0	0	0	0
Sr-Strontium	.011	.01	.01	.01	.011	.011	.011	.011	.011	.01	.011
Ti-Titanium	0	0	0	0	.004	.004	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.001	.001	.022	.007	0	0	0	0	0	.028	0

WATER QUALITY VALUES FOR TSOLUM SATELLITE
(below detection limits = 0)

PARAMETERS	MAY12/82 HEADQUARTERS CREEK	MAY26/82 HEADQ. CREEK	MAY26/82 HEADQ. CREEK	JUN08/82 HEADQ. CREEK	JUN08/82 HEADQ. CREEK	AUG18/82 HEADQ. CREEK	AUG18/82 HEADQ. CREEK	SEP29/82 HEADQ. CREEK	SEP29/82 HEADQ. CREEK	OCT13/82 HEADQ. CREEK	OCT13/82 HEADQ. CREEK
Alkalinity		9		10							
Ammonia				.005							
CO2											
Chloride		.6		1.3							
Color											
Conductivity Field											
Conductivity Lab		28.2		30.4							
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	10.8	11	11.1	12	11.9	12.6	12.6	11.2	11.1	12.6	12.6
Nitrite		.008	0	0							
Nitrate		.01		.05							
pH-Field		7.3									
pH-Lab		7.3		7.3							
Phosphate		.006		0							
Residue Filterable		22		36							
Residue Non-Filter		0		0							
Silica		1.5		1.8							
Sulphate		3.6		4.2							
Taste											
Temperature											
Turbidity		1		.2							
METALS—											
Al-Aluminum	.05	.06	.06	0	0	.05	0	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	0	0	0	0	0	.02	.041	.001	.001
Ca-Calcium	3.2	3.2	3.2	3.6	3.5	3.9	3.9	3.7	3.7	3.9	3.9
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.042	.092	.089	.062	.049	.121	.123	0	0	.093	.099
Hg-Mercury	0	0	0	0	0	0		0	0	0	0
K—Potassium	.13	.12	.12	.14	.14						
Mg-Magnesium	.6	.6	.6	.7	.7	.7	.7	.6	.6	.6	.6
Mn-Manganese	.003	.014	.004	.003	.003	.005	.005	0	0	.005	.005
Mo-Molybdenum	0	0	0	0	0	.005	0	0	0	0	0
Na-Sodium	1	1.2	1.1	1.2	1.2	1.3	1.4	1.3	1.3	1.2	1.2
Ni-Nickle	0	0	0	0	0	.02	0	0	0	0	.03
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	.02	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	1.8	1.7	1.8	1.8	1.8	1.6	1.6	1.5	1.5	1.6	1.6
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.011	.011	.01	.012	.012	.013	.013	.013	.013	.013	.013
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR TSOLUM SATELLITE
(below detection limits = 0)

PARAMETERS	OCT27/82 HEADQUARTERS CREEK	OCT27/82 HEADQ. CREEK	NOV24/82 HEADQ. CREEK	NOV24/82 HEADQ. CREEK	DEC08/82 HEADQ. CREEK	DEC08/82 HEADQ. CREEK	JAN05/83 HEADQ. CREEK	JAN05/83 HEADQ. CREEK	JAN19/83 HEADQ. CREEK	JAN19/83 HEADQ. CREEK	FEB03/83 HEADQ. CREEK
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	11.9	12	9.61	9.56	10.4	10.4	9.58	9.45	10.1	10.1	9.84
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	.2	.2	0	0	.07	.08	.09	.07	.1	.1	.09
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.001	.001	0	0	0	0	0	0	0	0	0
Ca-Calcium	3.3	3.3	2.7	2.6	3	3	2.7	2.7	2.9	2.9	2.8
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.202	.204	.059	.059	.067	.067	.062	.062	.076	.08	1.9
Hg-Mercury	0	0	0	0	0	0	0	0	0	0	0
K—Potassium							.13	.13	.13	.13	.12
Mg-Magnesium	.5	.5	.6	.6	.6	.8	.5	.5	.5	.5	.5
Mn-Manganese	.012	.012	0	0	0	0	.003	.003	.003	.004	.003
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	1.1	1.1	.9	.9	.5	.5	1.1	1.1	1	1	1
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	1.8	1.8	1.9	1.9	.1	.1	1.9	1.9	1.9	1.9	1.9
Sn-Tin	.01	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.01	.01	.011	.011	.01	.01	.009	.009	.009	.01	.009
Ti-Titanium	.006	.005	0	0	0	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR TSOLUM SATELLITE
(below detection limits = 0)

PARAMETERS	FEB03/83 HEADQUARTERS CREEK	FEB23/83 HEADQ. CREEK	FEB23/83 HEADQ. CREEK	MAR16/83 HEADQ. CREEK	MAR16/83 HEADQ. CREEK	APR06/83 HEADQ. CREEK	APR06/83 HEADQ. CREEK	APR20/83 HEADQ. CREEK	APR20/83 HEADQ. CREEK	MAY25/83 HEADQ. CREEK	MAY25/83 HEADQ. CREEK
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	9.96	9.69	9.74	9.2	9.07	8.44	9.05	9.54	9.99	10.9	10.8
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	.1	.16	.16	.14	.14	.09	.09	0	.07	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	0	0	0	0	0	0	0	0	0
Ca-Calcium	2.8	2.6	2.6	0	0	.001	.001	2.9	2.9	3.3	3.3
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	.001	.001	0	0	0	0
Fe-Iron	1.9	2.1	2.1	.129	.126	.085	.082	.065	.067	.058	.059
Hg-Mercury	0	0	0	0	0	0	0				
K—Potassium	.12	.11	.12	.09	.09	.1	.1	.11	.11		
Mg-Magnesium	.5	.5	.5	.5	.5	.5	.5	.5	.5	.6	.6
Mn-Manganese	.003	.006	.006	.005	.005	.004	.004	.004	.004	.004	.004
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	1	1	1	.9	.9	1	1	1	1	1.2	1.2
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	.002	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	1.9	2.1	2.1	1.8	1.8	1.9	1.9	1.8	1.8	1.7	1.7
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.009	.009	.009	.009	.008	.009	.01	.011	.01	.012	.012
Ti-Titanium	0	0	0	.007	.007	.004	.005	0	.002	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	.008	0	0	0	.028	.029

WATER QUALITY VALUES FOR TSOLUM SATELLITE
(below detection limits = 0)

PARAMETERS	NOV24/83 HEADQUARTERS CREEK	NOV24/83 HEADQ. CREEK	JAN04/84 HEADQ. CREEK	JAN04/84 HEADQ. CREEK	MAR07/84 HEADQ. CREEK	MAR07/84 HEADQ. CREEK	APR11/84 HEADQ. CREEK	APR11/84 HEADQ. CREEK	MAY23/84 HEADQ. CREEK	MAY23/84 HEADQ. CREEK	JUN13/84 HEADQ. CREEK
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	10	9.98	9.79	9.59	10.1	10.1	10.3	10.4	10.4	10.2	11.5
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	.21	.21	0	0	0	.06	0	.06	.06	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.002	.002	.001	0	0	0	0	0	0	0	0
Ca-Calcium	2.5	2.5	.106	.108	3	3	3.1	3.1	3	3	3.5
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	.001	.001	0	0	0	0	0	0	0	0	0
Fe-Iron	.187	.157	.106	.108	.052	.051	.061	.06	.068	.065	.044
Hg-Mercury											
K—Potassium											
Mg-Magnesium	.5	.5	.5	.5	.5	.5	.5	.5	.6	.5	.6
Mn-Manganese	.008	.008	.008	.008	.003	.004	.004	.004	.003	.003	.005
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	1.1	1.1	1	1	1.1	1.1	1.1	1.1	1.2	1.1	1.2
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	2.2	2.2	2.1	2.1	2.1	2.1	2	2	1.7	1.7	2.1
Sn-Tin	0	0	0	0	0	0	0	0	0	0	.01
Sr-Strontium	.01	.01	.01	.01	.011	.011	.011	.011	.011	.011	.012
Ti-Titanium	.01	.009	.006	.006	.002	.003	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR TSOLUM SATELLITE
(below detection limits = 0)

PARAMETERS	JUN13/84 HEADQUARTERS CREEK	JUL13/84 HEADQ. CREEK	JUL13/84 HEADQ. CREEK	AUG21/84 HEADQ. CREEK	AUG21/84 HEADQ. CREEK	SEP12/84 HEADQ. CREEK	SEP12/84 HEADQ. CREEK	OCT16/84 HEADQ. CREEK	OCT16/84 HEADQ. CREEK	NOV06/84 HEADQ. CREEK	NOV06/84 HEADQ. CREEK
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	11.5	13.4	13.2	13.8	13.7	14.4	14.3	13.2	13.3	12.1	12
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	0	0	0	0	0	0	0	.05	0	.15	.14
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	0	.001	.001	.001	.001	.001	.001	.001	.001
Ca-Calcium	3.5	4.1	4	4.1	4.1	4.2	4.2	3.3	3.4	3.1	3.1
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.045	.069	.069	.145	.144	.224	.223	.177	.177	.111	.109
Hg-Mercury											
K—Potassium				.15	.17						
Mg-Magnesium	.6	.7	.7	.8	.8	.8	.8	1	1	.8	.8
Mn-Manganese	.004	.003	.003	.003	.003	.005	.005	.006	.008	.007	.008
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	.007
Na-Sodium	1.2	1.5	1.5	1.6	1.8	1.7	1.6	1.3	1.3	1.3	1.3
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	.06	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	2.1	1.9	1.9	2.2	2.2	2.3	2.3	2.8	2.8	2.2	2.2
Sn-Tin	0	.02	.01	0	0	.05	.1	0	.01	0	.01
Sr-Strontium	.012	.013	.013	.015	.015	.015	.015	.009	.009	.011	.011
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR TSOLUM SATELLITE
(below detection limits = 0)

PARAMETERS	DEC19/84 HEADQUARTERS CREEK	DEC19/84 HEADQ. CREEK	JAN15/85 HEADQ. CREEK	JAN15/85 HEADQ. CREEK	FEB12/85 HEADQ. CREEK	FEB12/85 HEADQ. CREEK	MAR13/85 HEADQ. CREEK	MAR13/85 HEADQ. CREEK	APR10/85 HEADQ. CREEK	APR10/85 HEADQ. CREEK	MAY15/85 HEADQ. CREEK
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	11	11	12.3	12.2	11.7	11.6	11.3	11.2	12.7	13.3	13.1
Nitrite											
Nitrate											
pH-Field											
pH-Lab											
Phosphate											
Residue Filterable											
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature			3	3	2.3	2.3	5	5	9.6	9.6	11.6
Turbidity											
METALS—											
Al-Aluminum	0	.05	.06	0	.12	.11	0	0	0	.06	.06
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	0	0	0	0	0	0	0	0	0	0	0
Ca-Calcium	3.2	3.2	3.5	3.6	3.1	3.1	3.3	3.3	3.9	4	3.9
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.058	.059	.101	.102	.177	.176	.075	.074	.053	.059	.064
Hg-Mercury											
K—Potassium											
Mg-Magnesium	.7	.6	.7	.7	.7	.7	.6	.6	.7	.7	.7
Mn-Manganese	.003	.003	.006	.006	.009	.009	.005	.005	.004	.005	.005
Mo-Molybdenum	0	.005	0	0	0	0	0	0	0	0	0
Na-Sodium	1.2	1.2	1.3	1.3	1.4	1.4	1.2	1.2	1.6	1.5	1.2
Ni-Nickle	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	1.9	1.9	1.6	1.6	.5	.5	2.1	2.1	2.2	2.2	2
Sn-Tin	0	0	0	0	0	0	0	0	0	0	0
Sr-Strontium	.01	.011	.012	.013	0	0	.011	.012	.014	.013	0
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	.004	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR TSOLUM SATELLITE
(below detection limits = 0)

PARAMETERS	MAY15/85 HEADQUARTERS CREEK	JUN03/85 HEADQ. CREEK	JUN03/85 HEADQ. CREEK	JUN06/85 HEADQ. CREEK	JUN06/85 HEADQ. CREEK	JUL10/85 HEADQ. CREEK	JUL10/85 HEADQ. CREEK	JUL15/85 HEADQ. CREEK	JUL15/85 HEADQ. CREEK	AUG20/85 HEADQ. CREEK	AUG20/85 HEADQ. CREEK
Alkalinity											
Ammonia											
CO2											
Chloride											
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	13.3	10.2	10.1	13.3	13	14.4	14.3	16.2	16.2	16.2	16.2
Nitrite											
Nitrate											
pH-Field				7.49							
pH-Lab											
Phosphate											
Residue Filterable					14.3	16.2	16.2			16	16.5
Residue Non-Filter											
Silica											
Sulphate											
Taste											
Temperature	11.6			15							
Turbidity											
METALS—											
Al-Aluminum	.1	.11	.11	0	0	0	0	0	0		
As-Arsenic	0	0	0	0	0	0	0	0	0		
Ba-Barium	0	.001	.001	0	.001	0	.001	.001	.001		
Ca-Calcium	3.9	2.9	2.8	4.1	4	4.4	4.4	4.9	4.9	4.9	4.9
Cd-Cadmium	0	0	0	0	0	0	0	0	0	.009	.008
Co-Cobalt	0	0	0	0	0	0	0	0	0		
Cr-Chromium	0	0	0	0	0	0	0	0	0		
Cu-Copper	0	.047	.045	0	0	0	0	0	0	0	0
Fe-Iron	.066	.113	.113	.085	.085	.081	.081	0	0	.14	.14
Hg-Mercury											
K--Potassium											
Mg-Magnesium	.7	.5	.5	.7	.6	.8	.8	.9	.9	.9	.9
Mn-Manganese	.005	.009	.009	.005	.005	.005	.005	.006	.008	.008	.006
Mo-Molybdenum	0	0	0	0	0	0	0	0	0		
Na-Sodium	1.2	.8	.8	1.2	1.2	1.4	1.4	1.8	1.8	1.8	1.8
Ni-Nickle	0	0	0	0	0	0	0	0	0		
P--Phosphorus	0	0	0	0	0	0	0	0	0		
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0		
Se-Selenium	0	0	0	0	0	0	0	0	0		
Si-Silicon	2	1.5	1.5	1.6	1.5	1.7	1.7	2	1.9		
Sn-Tin	0	0	0	.03	0	0	0	0	0		
Sr-Strontium	.06	.009	.009	.013	.013	.014	.014	.017	.016		
Ti-Titanium	0	0	0	0	0	0	0	0	0		
V--Vanadium	0	0	0	0	0	0	0	0	0		
Zn-Zinc	0	.022	.013	.003	0	.006	0	0	0	0	0

WATER QUALITY VALUES FOR TSOLUM SATELLITE
(below detection limits = 0)

PARAMETERS	OCT09/85 HEADQUARTERS CREEK	OCT09/85 HEADQ. CREEK	DEC09/85 HEADQ. CREEK	DEC09/85 HEADQ. CREEK
Alkalinity				
Ammonia				
CO2				
Chloride				
Color				
Conductivity Field				
Conductivity Lab				
Dissolved O2-ppm				
Dissolved O2-%sat				
Dissolved Gas Tot				
Dissolved Nitrogen				
Hardness	16	16.5	12	12
Nitrite				
Nitrate				
pH-Field				
pH-Lab				
Phosphate				
Residue Filterable		12		0
Residue Non-Filter				
Silica				
Sulphate				
Taste				
Temperature				
Turbidity				
METALS—				
Al-Aluminum				
As-Arsenic				
Ba-Barium				
Ca-Calcium	4.5	4.6	3.4	3.4
Cd-Cadmium	.007	.006	0	0
Co-Cobalt			0	0
Cr-Chromium			0	0
Cu-Copper	0	0	0	0
Fe-Iron	.091	.095	.122	.123
Hg-Mercury				
K—Potassium				
Mg-Magnesium	1.1	1.2	.7	.7
Mn-Manganese	.009	.008	.007	.006
Mo-Molybdenum			0	0
Na-Sodium	1.8	1.8	1.4	1.4
Ni-Nickle			0	0
P—Phosphorus			0	0
Pb-Lead	0	0	0	0
Sb-Antimony			0	0
Se-Selenium			0	0
Si-Silicon			1.8	1.8
Sn-Tin			0	0
Sr-Strontium			.013	.013
Ti-Titanium			.004	.004
V—Vanadium			0	0
Zn-Zinc	0	0	0	0

PUNTLEDGE RIVER 1965

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY	4.44	5.56	5	13
MARCH	3.89	5.83	4.96	30
APRIL	5.56	8.89	7.22	29
MAY	7.5	12.5	10.24	30
JUNE	13.33	17.22	14.97	9
JULY	15.56	20.56	18.34	31
AUGUST	16.67	21.11	19.27	28
SEPTEMBER	15	19.44	17.03	17
OCTOBER	11.11	16.67	13.19	31
NOVEMBER	7.78	11.11	9.36	30
DECEMBER	5	8.06	6.72	30

PUNTLEDGE RIVER 1966

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	4.17	5.56	4.75	30
FEBRUARY	4.44	5	4.68	15
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE	10	13.89	12.24	30
JULY	12.22	20	16.32	31
AUGUST	16.67	20.83	18.55	30
SEPTEMBER	14.44	18.33	16.32	30
OCTOBER	10.56	15.83	12.82	30
NOVEMBER	7.78	11.11	9.09	29
DECEMBER	5.56	7.78	6.54	30

PUNTLEDGE RIVER 1967

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.89	6.11	5.1	31
FEBRUARY	4.44	5.83	5.22	28
MARCH	4.44	6.67	5.01	31
APRIL	5	8.89	6.99	30
MAY	7.78	13.06	9.9	31
JUNE	10.83	17.78	14.85	30
JULY	15	20	17.99	31
AUGUST	18.33	22.78	20.67	31
SEPTEMBER	16.11	21.11	18.03	30
OCTOBER	10	16.11	12.58	30
NOVEMBER	7.22	10.56	8.92	30
DECEMBER	4.44	7.22	6.09	31

PUNTLEDGE RIVER 1968

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.89	5.56	4.72	31
FEBRUARY	3.89	5	4.25	28
MARCH	4.44	6.11	5.15	31
APRIL	5.56	7.78	6.34	29
MAY	6.67	12.78	9.91	31
JUNE	11.67	16.11	13.71	30
JULY	15	20.56	17.89	31
AUGUST	15.83	21.11	18.69	31
SEPTEMBER	13.89	18.33	16.17	30
OCTOBER	9.44	14.44	11.61	31
NOVEMBER	7.22	9.44	7.95	30
DECEMBER	3.33	7.22	5.36	31

PUNTLEDGE RIVER 1969

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.78	3.89	3.42	31
FEBRUARY	1.67	3.89	3.11	28
MARCH	2.78	5.28	3.92	31
APRIL	3.89	6.67	5.08	30
MAY	5.56	11.11	8.81	31
JUNE	9.44	16.11	13.2	30
JULY	13.33	19.72	16.58	31
AUGUST	14.44	19.44	16.55	31
SEPTEMBER	13.06	17.5	14.04	30
OCTOBER	10.83	14.44	12.35	31
NOVEMBER	7.78	11.11	9.37	30
DECEMBER	6.11	8.06	7.04	31

PUNTLEDGE RIVER 1970

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.89	6.67	5.14	31
FEBRUARY	3.89	6.11	4.91	28
MARCH	3.89	8.89	5.48	31
APRIL	5.83	9.17	7.32	30
MAY	7.78	13.89	9.98	31
JUNE	12.22	18.33	15	30
JULY	15.56	20.56	17.7	31
AUGUST	16.67	19.44	17.99	31
SEPTEMBER	13.33	18.33	15.66	30
OCTOBER	9.72	15.56	12.34	31
NOVEMBER	5.56	10.56	8.73	30
DECEMBER	3.89	6.11	5.08	31

PUNTLEDGE RIVER 1971

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.78	4.72	3.93	31
FEBRUARY	3.89	5	4.29	28
MARCH	2.78	5.56	4.13	31
APRIL	4.17	8.06	5.69	30
MAY	6.67	11.94	9.21	31
JUNE	9.44	13.89	12.2	30
JULY	10.83	21.67	15.2	31
AUGUST	16.11	20	18.06	31
SEPTEMBER	12.22	16.94	14.45	30
OCTOBER	8.33	13.33	11.37	31
NOVEMBER	6.11	8.89	7.3	30
DECEMBER	3.61	6.11	4.75	31

PUNTLEDGE RIVER 1972

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.22	4.44	3.35	30
FEBRUARY	1.11	3.61	2.98	28
MARCH	2.78	5.83	4.09	31
APRIL	4.44	6.67	5.5	30
MAY	5.83	11.67	8.6	31
JUNE	10	13.89	12.05	30
JULY	12.78	19.44	16.69	19
AUGUST	17.22	21.94	19.22	31
SEPTEMBER	12.78	20.83	16.41	29
OCTOBER	10	13.61	11.65	31
NOVEMBER	6.94	10	8.38	30
DECEMBER	3.61	7.5	5.35	31

PUNTLEDGE RIVER 1973

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.78	5.28	4.1	31
FEBRUARY	3.61	4.72	4.01	28
MARCH	3.89	6.11	4.68	31
APRIL	4.44	9.44	6.87	30
MAY	7.5	12.5	9.86	31
JUNE	9.17	15	12.21	30
JULY	12.78	18.89	15.75	25
AUGUST	14.72	20	17.71	31
SEPTEMBER	14.17	17.78	15.78	30
OCTOBER	10	15	12.21	31
NOVEMBER	6.11	10	7.63	30
DECEMBER	5	6.67	6.23	31

PUNTLEDGE RIVER 1974

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.33	5.28	4.58	31
FEBRUARY	3.61	5.28	4.64	28
MARCH	3.33	6.11	4.78	31
APRIL	4.44	8.33	6.42	30
MAY	6.67	11.67	8.89	31
JUNE	10	15.28	12	30
JULY	12.22	17.78	14.66	27
AUGUST	16.67	20.56	17.68	31
SEPTEMBER	15	20	17.59	30
OCTOBER	11.39	15.83	13.37	31
NOVEMBER	6.67	11.67	9.1	30
DECEMBER	5.56	8.06	6.87	31

PUNTLEDGE RIVER 1975

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.89	5.83	4.82	31
FEBRUARY	2.78	5	4.01	28
MARCH	3.33	6.67	4.91	31
APRIL	4.72	12.5	6.91	30
MAY	7.22	13.89	9.85	31
JUNE	11.94	14.44	13.33	4
JULY	17.22	20.56	18.78	18
AUGUST	16.11	20.28	17.91	31
SEPTEMBER	16.11	18.89	17.02	30
OCTOBER	8.33	16.67	13.12	31
NOVEMBER	5.83	9.44	8.01	30
DECEMBER	4.44	6.67	5.83	31

PUNTLEDGE RIVER 1976

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.61	6.11	5.11	31
FEBRUARY	4.17	5.56	4.88	28
MARCH	3.89	6.11	5.06	31
APRIL	4.72	9.44	6.61	30
MAY	7.36	11.67	9.67	31
JUNE	9.44	14.86	11.92	30
JULY	12.92	17.64	15.04	25
AUGUST	15	18.89	16.87	31
SEPTEMBER	15	17.22	16.22	30
OCTOBER	11.11	16.39	13.76	31
NOVEMBER	8.33	12.22	10.21	30
DECEMBER	6.67	8.89	7.86	31

PUNTLEDGE RIVER 1977

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	5.28	7.22	6.21	31
FEBRUARY	5.28	6.94	6.24	28
MARCH	5	7.36	5.86	31
APRIL	5.83	10.56	7.88	30
MAY	8.89	12.36	10.49	31
JUNE	10.28	17.78	14.23	30
JULY	14.44	20	16.9	31
AUGUST	18.06	23.47	20.69	31
SEPTEMBER	14.86	18.89	16.8	30
OCTOBER	11.11	15.56	13.09	31
NOVEMBER	6.67	11.11	8.56	30
DECEMBER	5.28	7.22	6.14	31

PUNTLEDGE RIVER 1978

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.06	5.56	4.56	31
FEBRUARY	3.89	5.83	4.62	28
MARCH	4.17	8.06	5.62	31
APRIL	6.11	9.44	7.23	30
MAY	7.5	12.78	10.14	31
JUNE	11.11	17.78	14.63	30
JULY	15.8	21.7	18.9	31
AUGUST	15.3	22.8	19.15	31
SEPTEMBER	12.8	17	14.67	30
OCTOBER	10.6	14.4	12.64	31
NOVEMBER	7.2	11.4	8.88	30
DECEMBER	3.9	7.8	5.84	31

PUNTLEDGE RIVER 1979

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.3	4.85	4.14	31
FEBRUARY	2.2	5	3.83	28
MARCH	3.9	6.9	5.18	31
APRIL	5	10.8	7.17	30
MAY	8.6	14.4	10.78	31
JUNE	11.7	16.1	13.93	24
JULY	16.4	21.4	18.99	16
AUGUST	18.3	21.4	19.66	31
SEPTEMBER	15	18.9	16.81	30
OCTOBER	10.6	16.1	13.56	31
NOVEMBER	7.8	11.1	9.3	30
DECEMBER	5.6	8	6.92	31

PUNTLEDGE RIVER 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.9	6.4	5.09	31
FEBRUARY	3.9	5.85	4.92	28
MARCH	4.4	7.2	5.61	31
APRIL	5.6	10	7.28	26
MAY	8.3	14.15	10.87	31
JUNE	10.5	16.7	13.88	30
JULY	13.3	20.3	16.75	31
AUGUST	17.2	21.7	19.39	31
SEPTEMBER	15	18.3	16.74	30
OCTOBER	12.2	16.1	14.12	26
NOVEMBER	8.3	12.6	10.47	30
DECEMBER	7.2	8.9	7.66	31

PUNTLEDGE RIVER 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	6.7	7.5	7.07	31
FEBRUARY	5.6	7.5	6.65	28
MARCH	6.6	9.2	7.5	31
APRIL	7.2	11.11	8.92	30
MAY	9.25	15	11.58	31
JUNE	12.7	16.7	14.16	30
JULY	15	21.7	18.26	27
AUGUST	18.3	24.2	21.12	31
SEPTEMBER	14.4	19.4	17.48	30
OCTOBER	11.3	16.66	13.73	31
NOVEMBER	8	12.2	9.57	30
DECEMBER	5.5	8	6.59	31

PUNTLEDGE RIVER 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.9	5.5	5.02	31
FEBRUARY	4	5.5	4.88	28
MARCH	4.5	7	5.65	31
APRIL	5.5	9.25	7.03	30
MAY	7.5	13	9.85	31
JUNE	11	19.5	14.23	30
JULY	14	20.25	16.45	31
AUGUST	16.5	20.25	18.07	31
SEPTEMBER	15	20.1	17.08	30
OCTOBER	10.5	16	13.08	31
NOVEMBER	7	10.3	9.18	9
DECEMBER	5.8	8	6.78	31

PUNTLEDGE RIVER 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	5	6	5.61	31
FEBRUARY	5	6	5.37	28
MARCH	5.2	7	6.12	31
APRIL	6	10.1	7.82	30
MAY	9.1	13.2	10.76	31
JUNE	12	14.1	13.35	30
JULY	13.6	18.25	15.6	31
AUGUST	16.75	20.2	18.43	31
SEPTEMBER	13.8	18.5	16.34	30
OCTOBER	10.4	15	12.44	31
NOVEMBER	6.8	10.8	8.86	30
DECEMBER	3.9	6.9	5.63	31

PUNTLEDGE RIVER 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	4.3	5.5	4.94	31
FEBRUARY	4.5	5.5	5.04	28
MARCH	5	7	5.84	31
APRIL	6	9.7	7.24	30
MAY	7.9	11.4	9.26	31
JUNE	10	15.5	12.48	30
JULY	12.8	20.1	16.23	31
AUGUST	16.8	20.2	18.12	31
SEPTEMBER	13.8	18	15.59	30
OCTOBER	8.7	15	11.84	31
NOVEMBER	6	9	7.66	30
DECEMBER	4.1	6.5	5.54	31

PUNTLEDGE RIVER 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	4.3	5.4	4.96	31
FEBRUARY	3.5	5.5	4.67	28
MARCH	4.1	7	5.31	31
APRIL	5.2	8.9	7.21	30
MAY	7	14	10.02	31
JUNE	11.5	17.6	13.95	30
JULY	14	22.8	19.57	31
AUGUST	17.7	21.7	19.54	31
SEPTEMBER	14.6	19.7	16.44	30
OCTOBER	9.8	15.8	12.18	31
NOVEMBER	4.8	10.2	7.47	30
DECEMBER	4.5	5.25	4.94	27

PUNTLEDGE RIVER 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	4	5.2	4.9	31
FEBRUARY	3.2	5.6	4.57	28
MARCH	4.8	6	5.4	16
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

HEADQUARTERS CREEK 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	11.5	16.5	13.87	19
OCTOBER	7	14.5	10.52	31
NOVEMBER	3.75	10	7.23	30
DECEMBER	.5	6.5	4.24	31

HEADQUARTERS CREEK 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3	6	4.82	31
FEBRUARY	.5	6.5	4.44	28
MARCH	4	9.5	6.45	31
APRIL	5	12	8.25	30
MAY	8	17	12.04	30
JUNE	11	16	13.76	9
JULY	12	21.75	16.98	29
AUGUST	12.75	22.25	17.42	31
SEPTEMBER	10	17.25	13.87	29
OCTOBER	6.5	11.25	9.23	31
NOVEMBER	4	9	7.1	30
DECEMBER	0	4.75	2.26	31

HEADQUARTERS CREEK 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	5	.69	29
FEBRUARY	-.5	1.5	.81	28
MARCH	1	6	2.54	31
APRIL	4	11	6.57	30
MAY	7.5	17	11.43	31
JUNE	11.5	22	16.69	30
JULY	14	22	17.09	16
AUGUST	12	20	16.2	30
SEPTEMBER	11	19	15.18	30
OCTOBER	7	13	10.31	31
NOVEMBER	2.75	8.75	5.68	30
DECEMBER	2.75	6	4.21	31

HEADQUARTERS CREEK 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2	4	3.56	31
FEBRUARY	2	5	3.86	28
MARCH	3.75	7.5	5.49	23
APRIL	5	14.25	8.42	30
MAY	10.5	13	11.88	2
JUNE	12.5	17	14.25	30
JULY	13	18.75	16.23	11
AUGUST	13	19.5	16.25	30
SEPTEMBER	9	16.5	13.44	30
OCTOBER	6.25	11.5	9.18	31
NOVEMBER	3.25	9	6.86	30
DECEMBER	-1	3	1.45	31

HEADQUARTERS CREEK 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	1.5	3.8	2.5	14
FEBRUARY	2.2	4.2	3.71	21
MARCH	3.5	7.5	5.23	29
APRIL	5.5	11.2	7.31	30
MAY	7.2	13.4	9.8	31
JUNE	11	17.2	13.68	30
JULY	12	20	15.59	31
AUGUST	12	19.4	15.11	31
SEPTEMBER	9.2	14.2	11.52	30
OCTOBER	2.1	13	8.16	24
NOVEMBER	-.8	6.1	4.09	30
DECEMBER	-.7	2.9	2.01	16

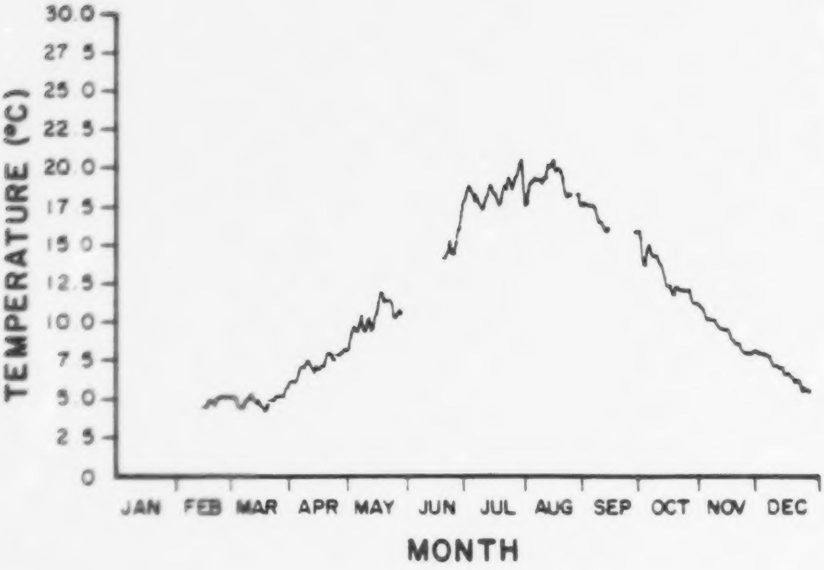
HEADQUARTERS CREEK 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.8	2.8	2	22
FEBRUARY	0	3.6	1.82	23
MARCH	1.1	5.6	3.71	23
APRIL	4.2	8.4	6.51	24
MAY		NO DATA		
JUNE	11.2	18.9	14.36	24
JULY	11.3	21.9	17.35	31
AUGUST	12.1	19.1	15.4	31
SEPTEMBER	9.8	15.8	12.56	25
OCTOBER	6.8	9.8	8.2	15
NOVEMBER	-.9	7.4	2.69	30
DECEMBER	-.9	3	1.72	31

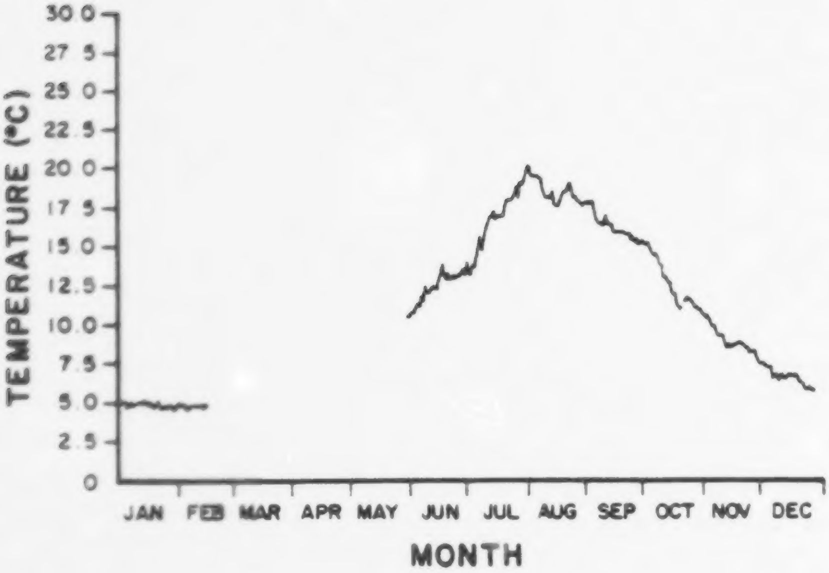
HEADQUARTERS CREEK 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	1.8	3.7	2.96	31
FEBRUARY	-.8	4.2	1.86	27
MARCH	3	6.1	4.84	22
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

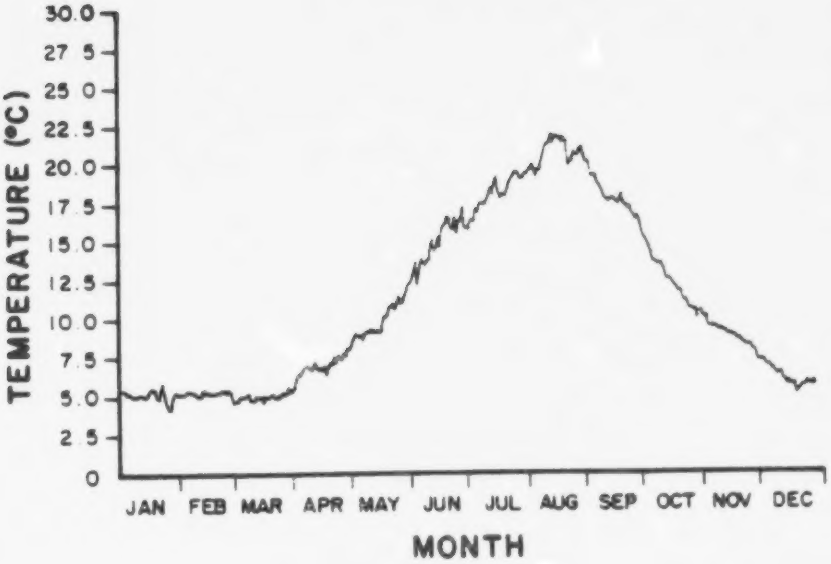
Puntledge River 1965



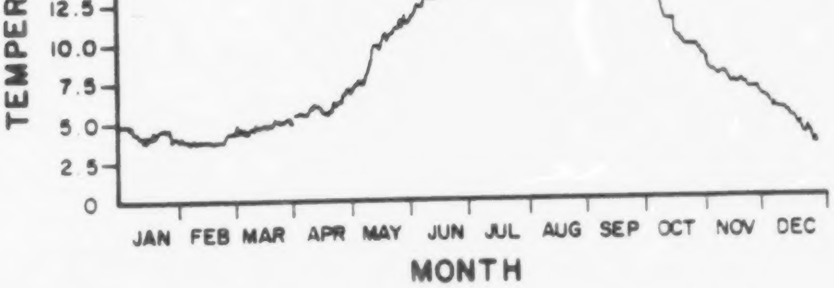
Puntledge River 1966

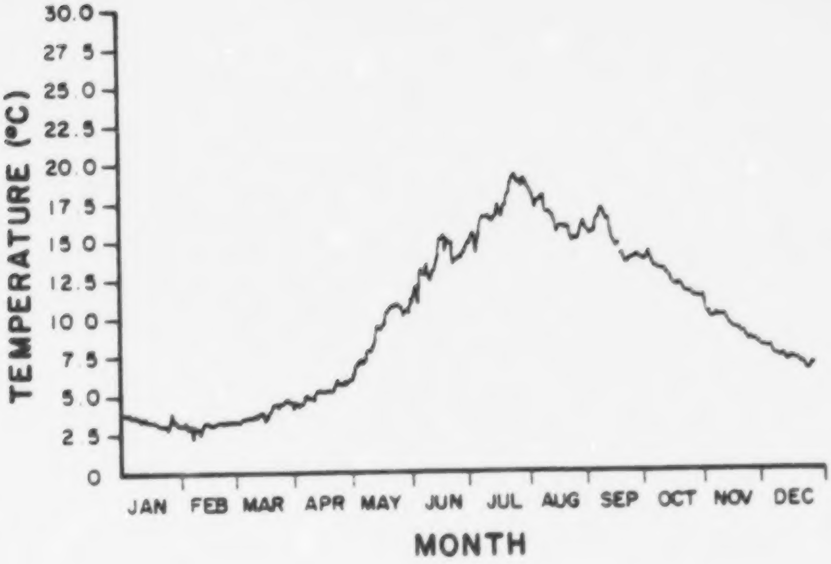


Puntledge River 1967

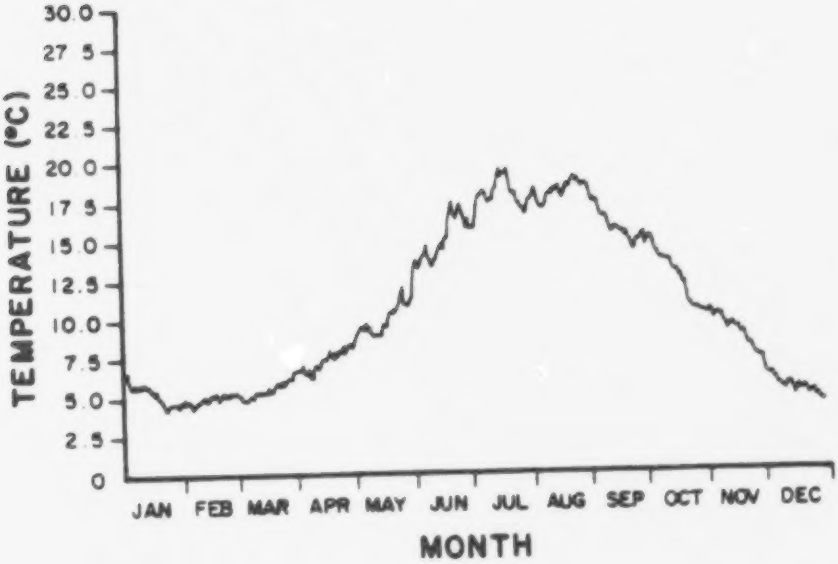


Puntledge River 1968

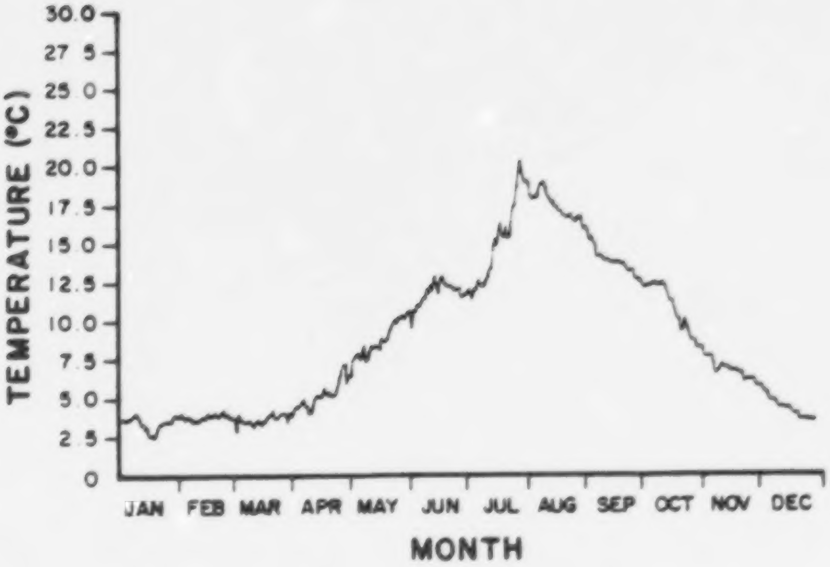




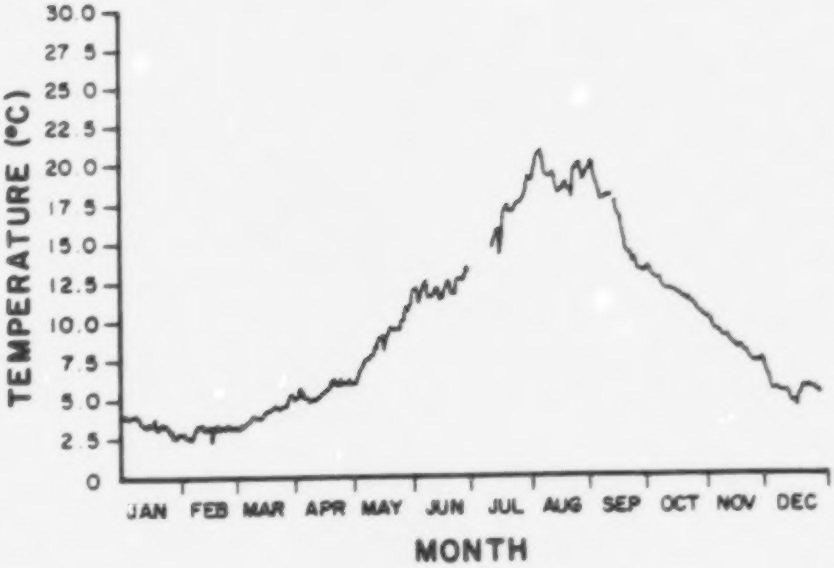
Puntledgde River 1969



Puntledge River 1970

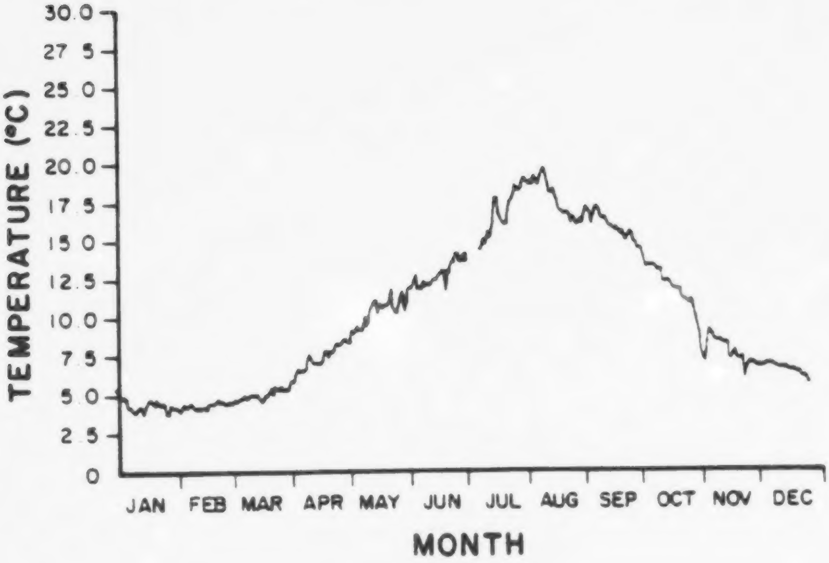


Puntledge River 1971

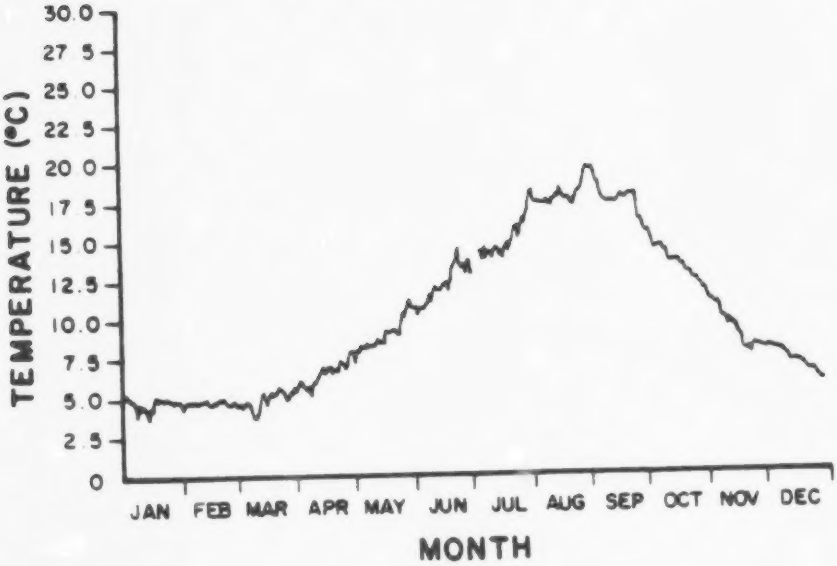


Puntledge River 1972

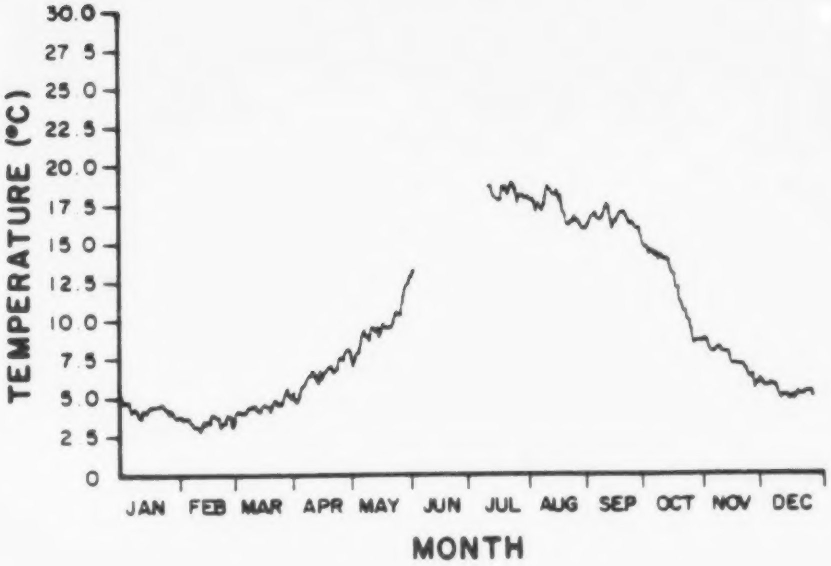
Puntledge River 1973



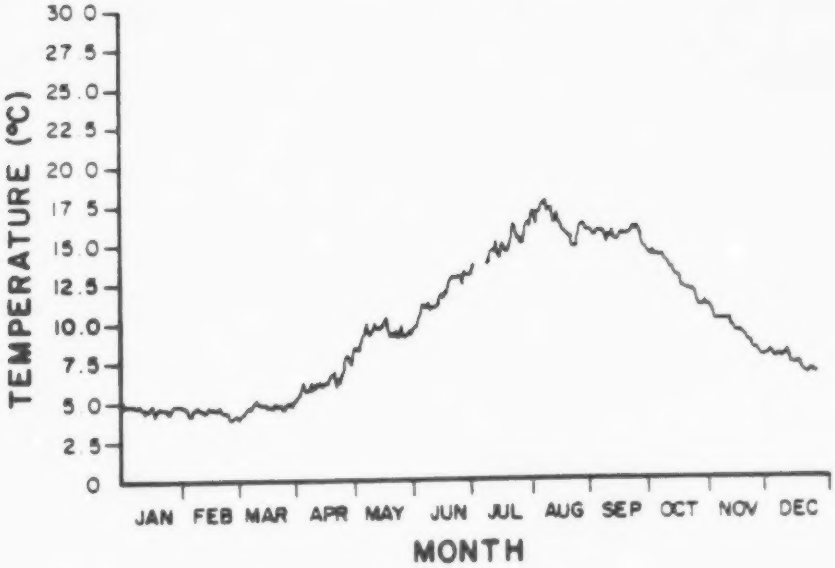
Puntledge River 1974

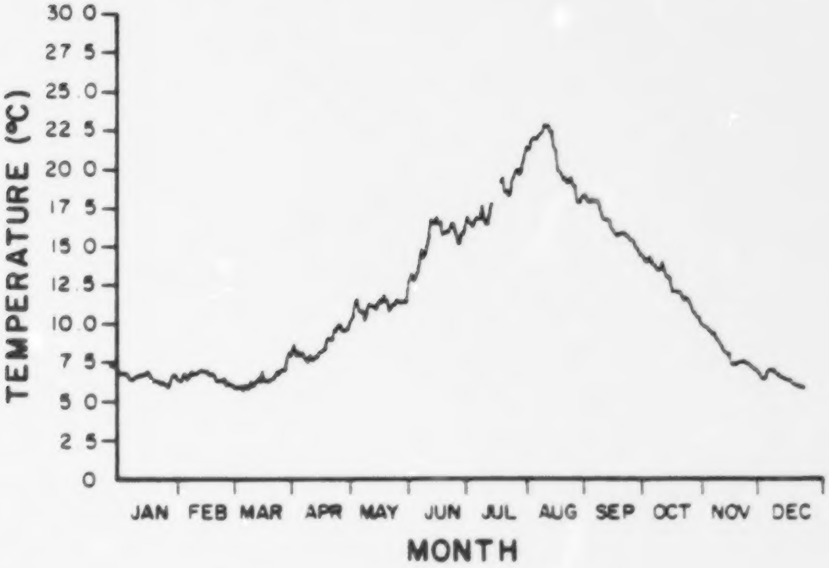


Puntledge River 1975

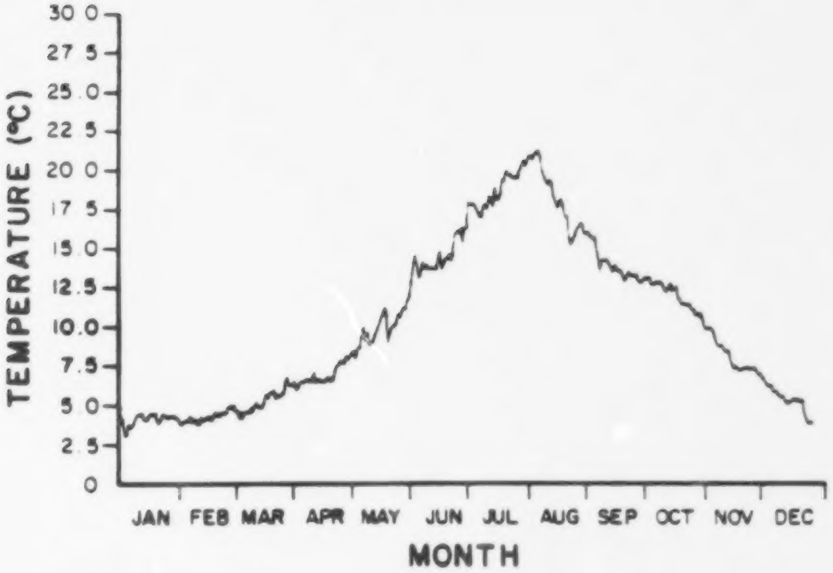


Puntledge River 1976



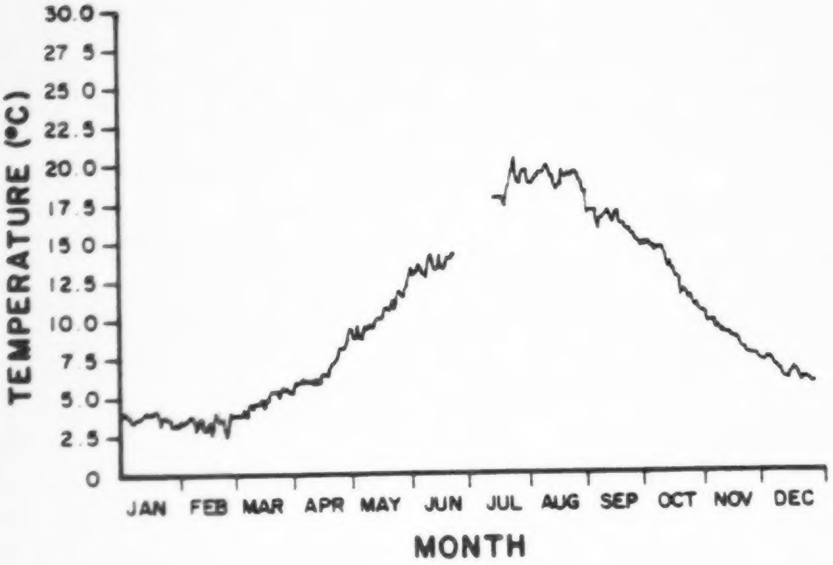


Puntledge River 1977

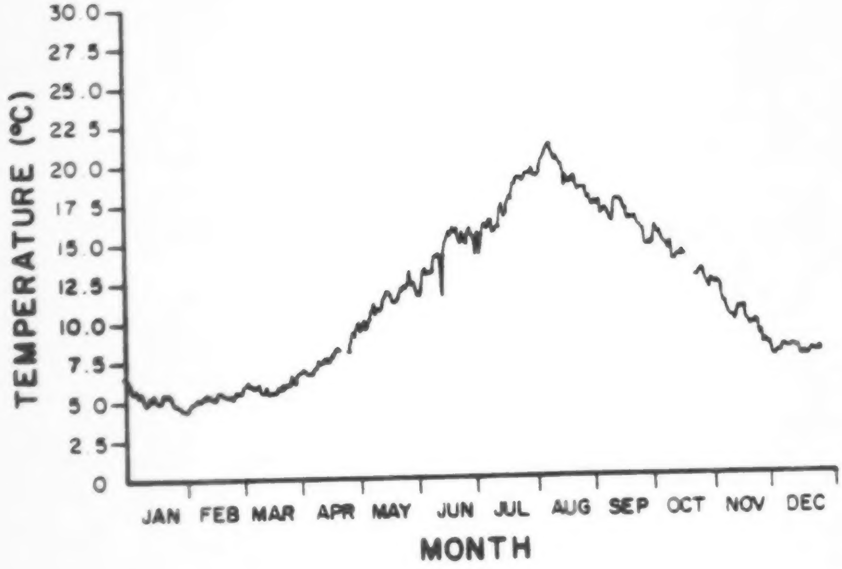


Puntledge River 1978

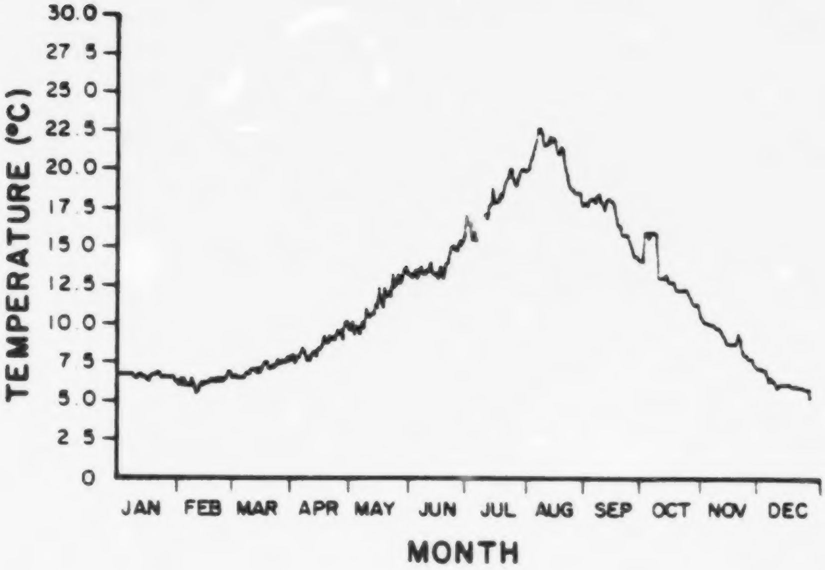
Puntledge River 1979



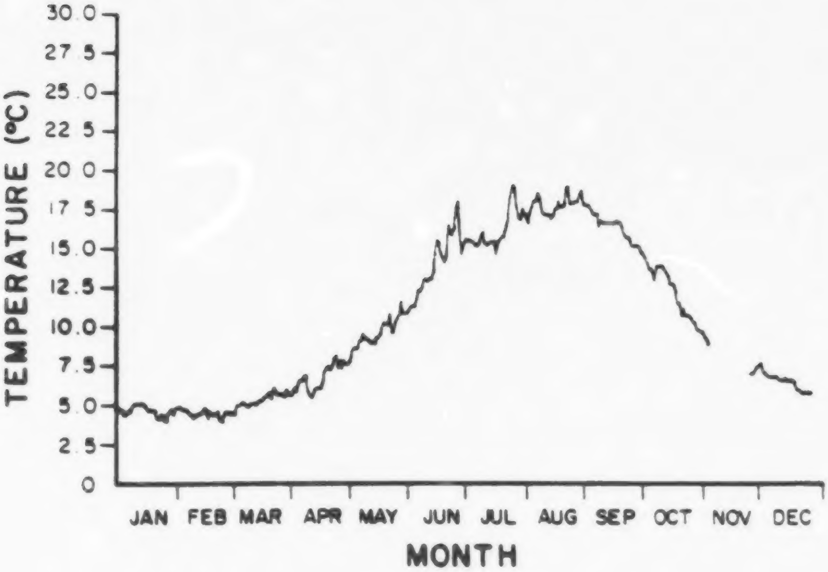
Puntledge River 1980



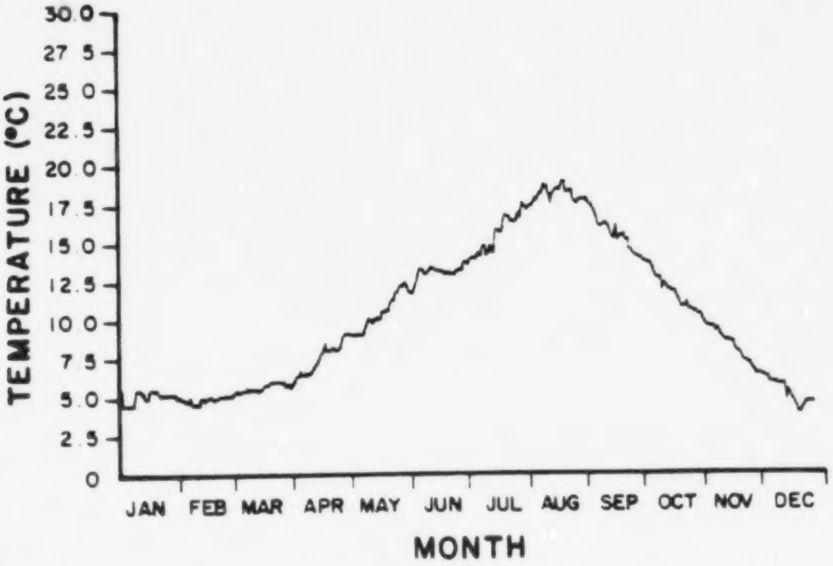
Puntledge River 1981



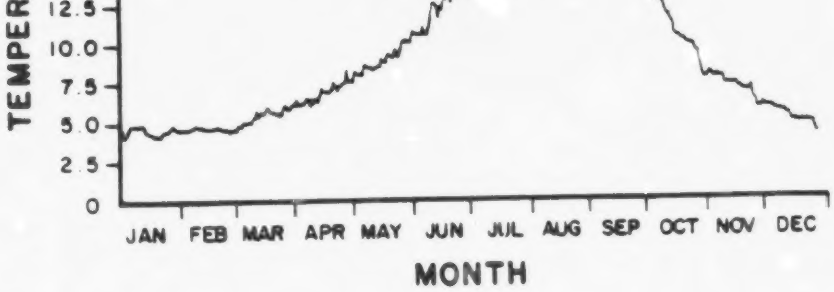
Puntledge River 1982

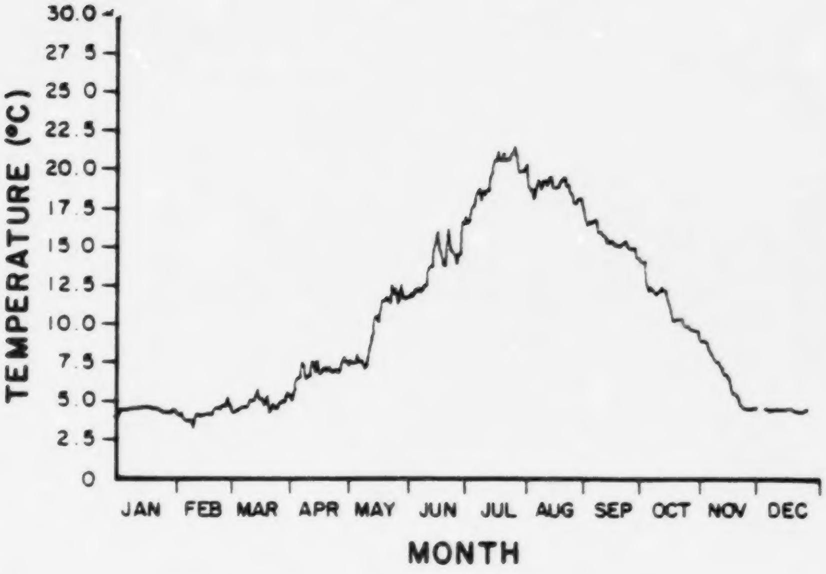


Puntledge River 1983

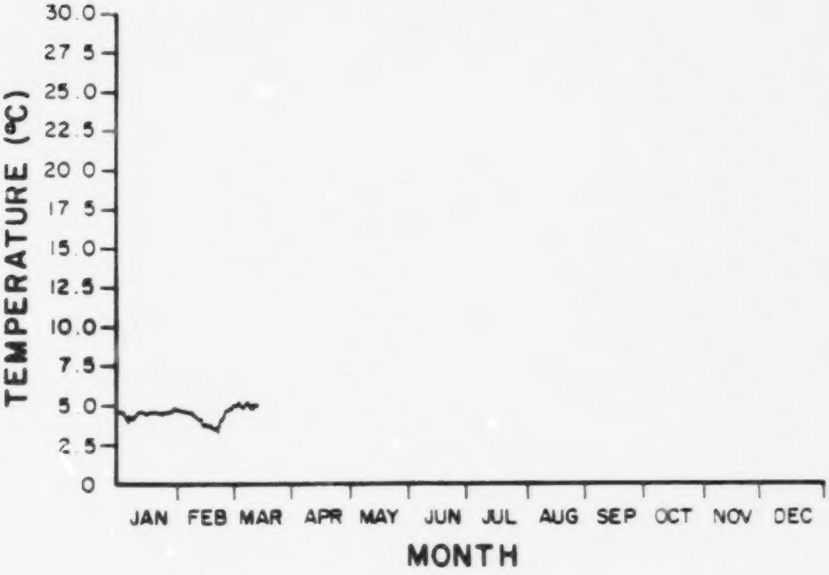


Puntledge River 1984

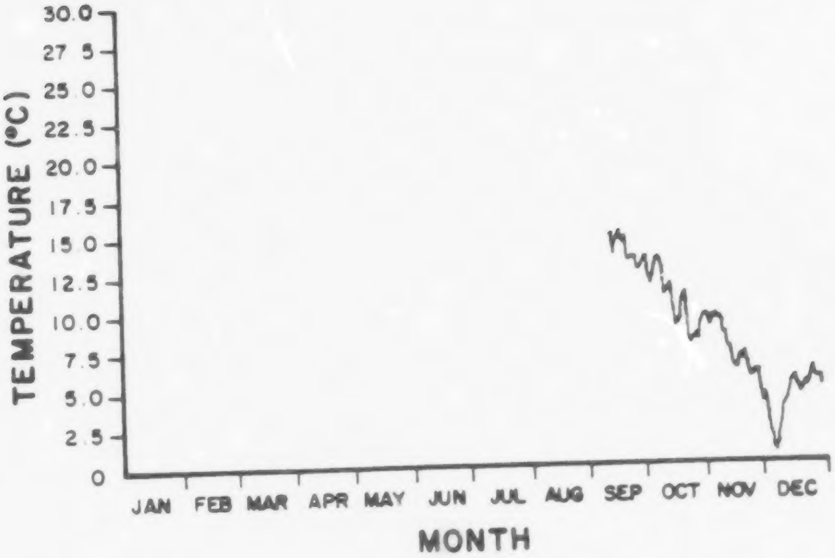




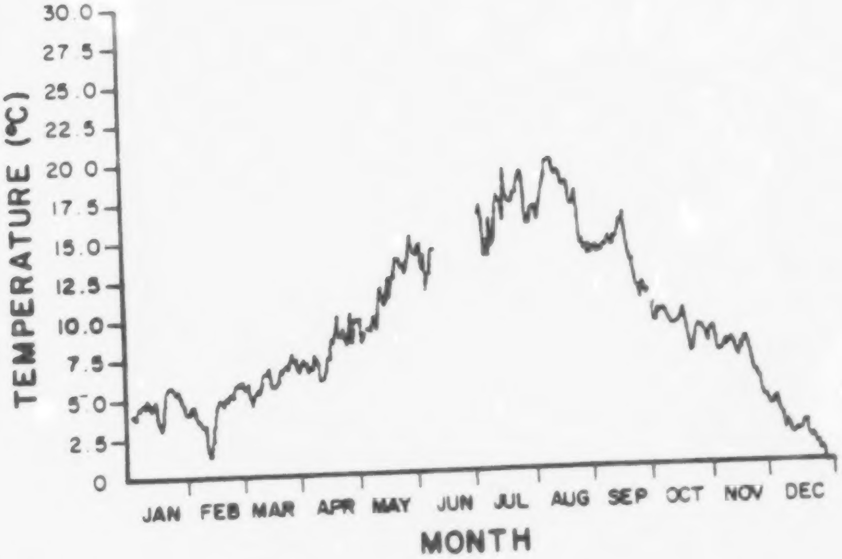
Puntledge River 1985



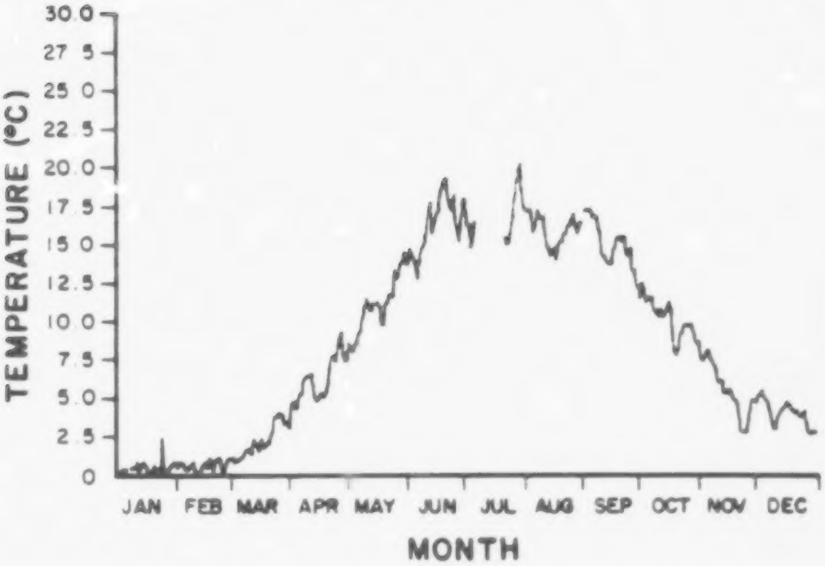
Puntledge River 1986

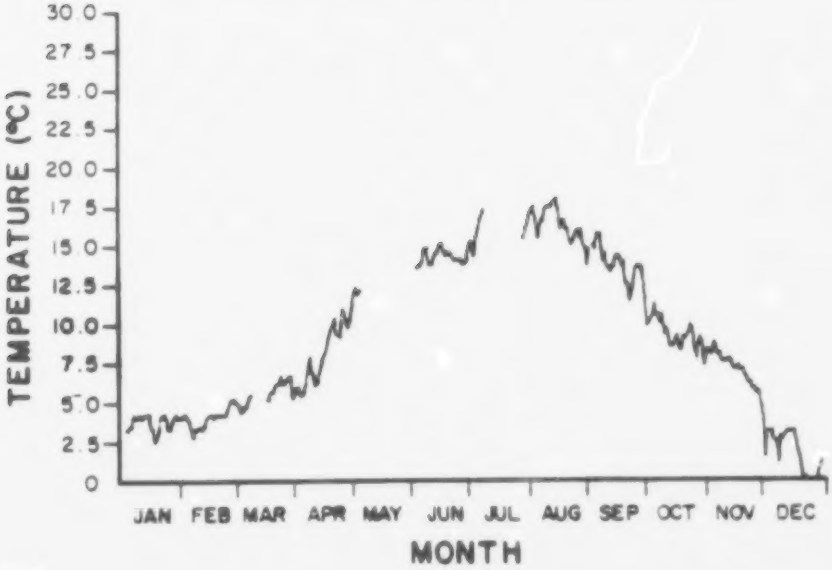


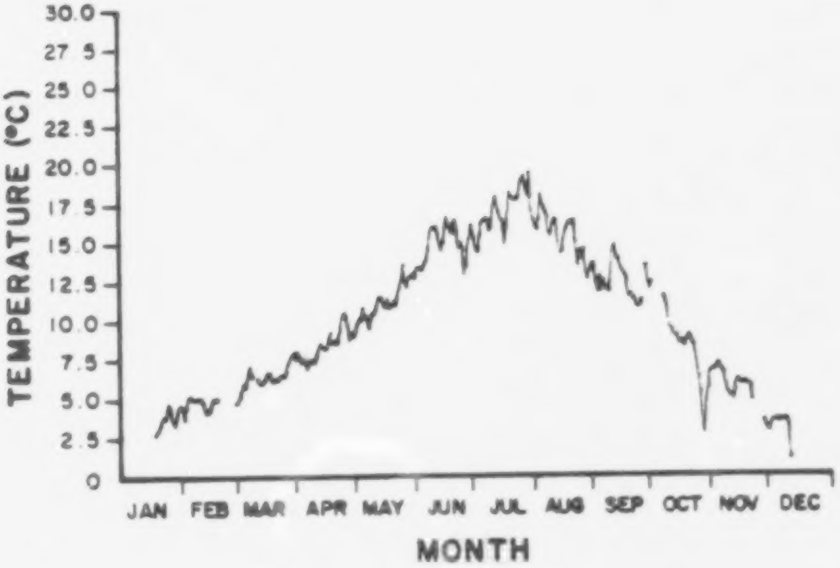
Headquarters Creek 1980



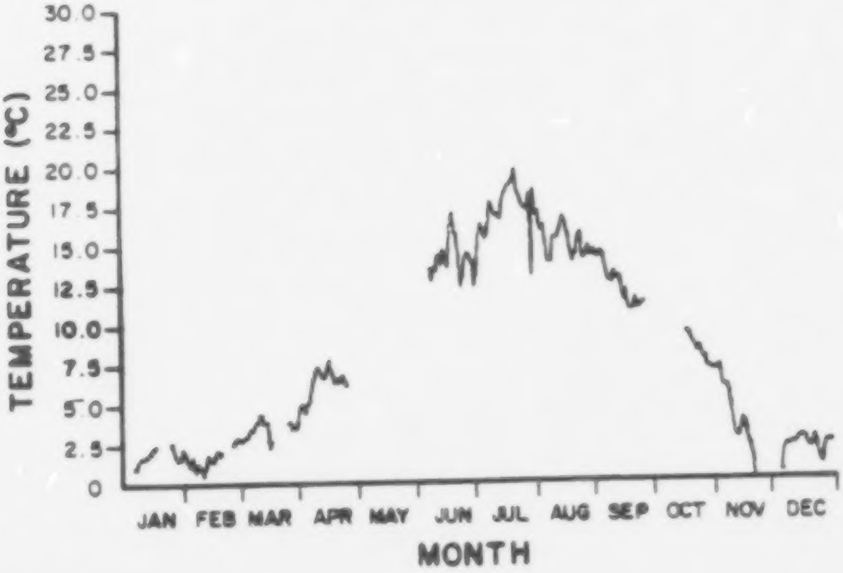
Headquarters Creek 1981


Headquarters Creek 1982


Headquarters Creek 1983

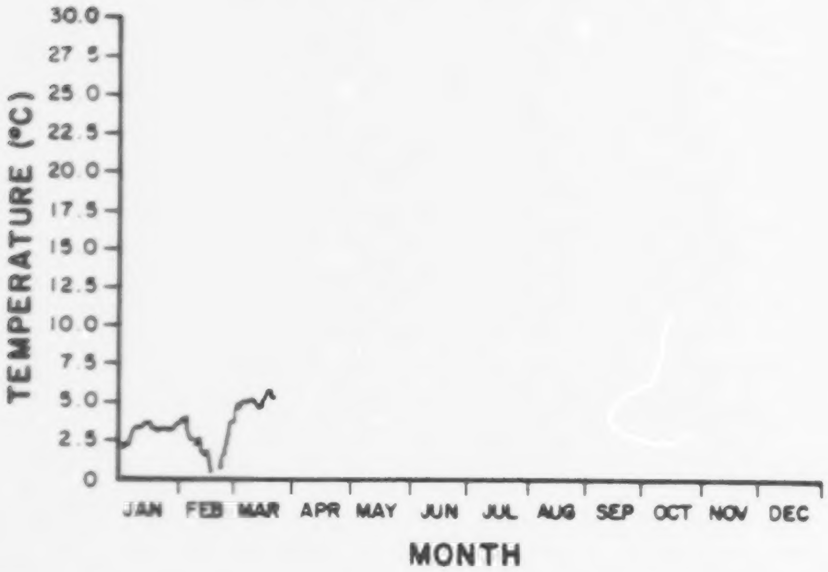


Headquarters Creek 1984



Headquarters Creek 1985

Headquarters Creek 1986



Facility: QUESNEL

Location:

Located 85 km northeast of 150 Mile House, and 2 km west of Likely, B.C.

Description:

Construction was completed in 1982. The facility was the first one built to enhance chinook stocks in the upper Fraser River watershed.

Production targets in 1985 were 2.5 M coho eggs and 50 K chinook eggs. Eggs are obtained from Quesnel River, Cariboo River, Blackwater River, Nazko River, Baezaeko River, Cottonwood River, Horsefly River, Willow River, McKinley Creek, Bowron River, Indian Point Creek, Seeback Creek, James Creek, Fontiniko Creek and Slim Creek. Juveniles are released back into natural spawning areas and collection sites.

Water Sources:

Surface. There is no surface water supply at present. Water sampling was done during the reconnaissance and feasibility period near the left bank, just downstream of the Likely Bridge.

Groundwater. Four wells (PW1 or Q-1; PW2; PW3 or well #3; and TW2 or Q-2) are currently used at this facility, although well PW2 is used only as a back-up for rearing.

General Water Quality:

The water is of good quality, although a bit cold. PW2 is too cold for rearing in winter, and well #3 is only marginally warm enough for rearing. Well water is mixed to manipulate water temperatures.

Special Notes:

For wells that have had only a few days per year for which water temperatures were taken (well PW1 in 1982; and well PW2 in 1980, 1982 and 1983), no graphs or tables are included. Additional temperature records for mixed well water for 1980 and 1981 and water quality records for the Quesnel River, and wells PW1, PW2 and TW2 can be found in MacKinlay (1984).

WATER QUALITY VALUES FOR QUESNEL
(below detection limits = 0)

PARAMETERS	APR17/80 QUESNEL RIVER	JUL24/84 QUESNEL RIVER	MAR21/83 WELL PW-1	FEB01/84 WELL PW-1	JUL22/84 WELL #3 22:30 HR	JUL23/84 WELL #3 08:45 HR	JUL23/84 WELL #3 20:35 HR	JUL24/84 WELL #3 08:30 HR	JUL24/84 WELL #3 20:30 HR	JUL25/84 WELL # 3	JUL25/84 WELL # 3
Alkalinity	50.8	40	62	68	102	91	88.5	85.5	86	77	78
Ammonia	0	0	0	.006	0	0	.008	0	0	0	0
CO2											
Chloride	.5	0	0	0	5.7	5	4.4	4.2	3.2	3.4	3.2
Color											
Conductivity Field											
Conductivity Lab	116	100.3	136	156.7	273	265	254	245	240	233	229
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	56	47.5	65.5		137	128	125	120	116	110	108
Nitrite	0	0	0	0	0	0	0	0	0	0	0
Nitrate	.115	.07	.17	.07	.4	.4	.4	.3	.34	.28	.27
pH-Field											
pH-Lab	7.8	7.7	8	7.7	7.7	7.7	7.7	7.7	7.7	7.8	7.8
Phosphate		.003	0	.008	.02	.008	0	0	.002	0	0
Residue-Filterable	71	70	85	107	180	176	168	162	158	148	144
Residue-Nonfilterable	0	0	0	0	28	0	0	0	0	0	0
Silica	1.78	1.7	1.9		3.6	3	2.9	2.8	2.8	2.7	2.7
Sulphate	6.4	6	6.8	5.3	23	29	28	27	25	24	23
Taste											
Temperature											
Turbidity	2.8	0	.1	0	10.8	.2	0	0	0	0	0
METALS											
Al-Aluminum	0	0	0		.28	0	0	0	0	0	0
As-Arsenic	0	0	0		0	0	0	0	0	0	0
Ba-Barium	.0064	.005	.003		.007	.005	.004	.004	.004	.004	.003
Ca-Calcium	17.6	16	22.6		43.6	41.2	40.4	39	37.8	35.5	35.1
Cd-Cadmium		0	0		0	0	0	0	0	0	0
Co-Cobalt	0	0	0		0	0	0	0	0	0	0
Cr-Chromium	0	0	0		0	0	0	0	0	0	0
Cu-Copper		0	0		.005	.002	0	0	0	.001	.001
Fe-Iron	.097	.019	0		.482	.036	.023	.019	.016	.01	.013
Hg-Mercury		0	0		0	0	0	0	0	.00008	.00007
K--Potassium	.468	.43	.34		.56	.48	.51	.45	.47	.51	.52
Mg-Magnesium	2.93	1.9	2.2		6.7	6.1	5.9	5.6	5.4	5	5
Mn-Manganese	.0056	.001	0		.022	.008	.005	.005	.005	.004	.004
Mo-Molybdenum	0	0	0		0	0	0	0	0	0	0
Na-Sodium	.889	.8	.9		2.1	1.7	1.8	1.8	1.7	1.7	1.7
Ni-Nickel	0	0	0		0	0	0	0	0	0	0
P--Phosphorus	0	0	0		0	0	0	0	0	0	0
Pb-Lead		0	0		.003	.004	0	0	0	.003	.004
Sb-Antimony	0	0	0		0	0	0	0	0	0	0
Se-Selenium	0	0	0		0	0	0	0	0	0	0
Si-Silicon	1.74	1.7	1.7		3.6	3	2.9	2.8	2.8	2.7	2.7
Sn-Tin	0	0	0		0	.01	0	0	0	0	0
Sr-Strontium	.134	.117	.123		.218	.214	.215	.207	.201	.191	.189
Ti-Titanium	0	0	0		.011	0	0	0	0	0	0
V--Vanadium	0	0	0		0	0	0	0	0	0	0
Zn-Zinc	0	.003	0		.004	.012	0	0	0	.003	0

WATER QUALITY VALUES FOR QUESNEL
(below detection limits = 0)

PARAMETERS	JUL28/84 WELL # 3
Alkalinity	78
Ammonia	0
CO2	
Chloride	3
Color	
Conductivity Field	
Conductivity Lab	226
Dissolved O2-ppm	
Dissolved O2-%sat	
Dissolved Gas Tot	
Dissolved Nitrogen	
Hardness	106
Nitrite	0
Nitrate	.27
pH-Field	
pH-Lab	7.8
Phosphate	0
Residue-Filterable	142
Residue-Nonfilterable	0
Silica	2.6
Sulphate	23
Taste	
Temperature	
Turbidity	0
METALS	
Al-Aluminum	0
As-Arsenic	0
Ba-Barium	.003
Ca-Calcium	34.3
Cd-Cadmium	0
Co-Cobalt	0
Cr-Chromium	0
Cu-Copper	0
Fe-Iron	.009
Hg-Mercury	.00006
K--Potassium	.53
Mg-Magnesium	4.8
Mn-Manganese	.004
Mo-Molybdenum	0
Na-Sodium	1.6
Ni-Nickel	0
P--Phosphorus	0
Pb-Lead	.004
Sb-Antimony	0
Se-Selenium	0
Si-Silicon	2.6
Sn-Tin	0
Sr-Strontium	.186
Ti-Titanium	0
V--Vanadium	0
Zn-Zinc	0

QUESNEL RIVER 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	1.98	19
FEBRUARY	-	-	1.61	20
MARCH	-	-	2.31	31
APRIL	-	-	3.87	21
MAY	-	-	5.23	6
JUNE	-	-	9.07	19
JULY	-	-	11.31	28
AUGUST	-	-	14.4	24
SEPTEMBER	-	-	12.92	13
OCTOBER	-	-	8.55	24
NOVEMBER	-	-	4.83	6
DECEMBER	-	-	2.4	14

QUESNEL RIVER 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	1.36	7
FEBRUARY	-	-	.97	6
MARCH	-	-	1.25	23
APRIL	-	-	2.08	24
MAY	-	-	3.96	24
JUNE	-	-	6.62	21
JULY	-	-	9.48	23
AUGUST	-	-	13.21	10
SEPTEMBER	-	-	12.19	14
OCTOBER	-	-	8.23	14
NOVEMBER	-	-	4.64	23
DECEMBER	-	-	2.56	17

QUESNEL RIVER 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	1.09	16
FEBRUARY	-	-	1.26	23
MARCH	-	-	2.39	24
APRIL	-	-	3.79	22
MAY	-	-	5.41	23
JUNE	-	-	6.64	19
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

WELL PW-1 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	7.78	21
FEBRUARY	-	-	6.5	27
MARCH	-	-	5.31	30
APRIL	-	-	4.9	26
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST	-	-	6	1
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER	-	-	11.43	15
DECEMBER	-	-	10.22	26

WELL PW-1 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	8.6	31
FEBRUARY	-	-	6.99	27
MARCH	-	-	4.45	31
APRIL	-	-	5.12	22
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER	-	-	7	1
OCTOBER	-	-	10.25	2
NOVEMBER	-	-	10.4	30
DECEMBER	-	-	9.06	30

WELL PW-1 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	7.47	21
FEBRUARY	-	-	6	5
MARCH	-	-	4.53	25
APRIL	-	-	4.05	30
MAY	-	-	3.9	5
JUNE		NO DATA		
JULY	-	-	4.7	2
AUGUST	-	-	5.4	1
SEPTEMBER	-	-	6	3
OCTOBER	-	-	7.73	3
NOVEMBER	-	-	9.38	26
DECEMBER	-	-	8.14	30

WELL PW-1 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	6.73	30
FEBRUARY	-	-	5.63	27
MARCH	-	-	4.57	29
APRIL	-	-	4.04	28
MAY	-	-	4.22	20
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

WELL PW-2 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	8.9	9.4	9.12	31
FEBRUARY	7.7	8.9	8.34	28
MARCH	6.1	7.7	6.93	31
APRIL	5.2	6.1	5.72	30
MAY	5	5.4	5.05	22
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

WELL PW-2 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL	-	-	2.9	1
MAY		NO DATA		
JUNE		NO DATA		
JULY	-	-	6.5	3
AUGUST	-	-	9.08	29
SEPTEMBER	-	-	11.03	30
OCTOBER	-	-	9.9	31
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

WELL PW-2 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY	-	-	5.43	4
MARCH	-	-	1.48	4
APRIL	-	-	1.75	2
MAY		NO DATA		
JUNE		NO DATA		
JULY	-	-	4.37	3
AUGUST	-	-	7.66	26
SEPTEMBER	-	-	8.83	29
OCTOBER	-	-	8.19	31
NOVEMBER	-	-	8	5
DECEMBER	-	-	6.5	6

WELL PW-2 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	3.13	4
FEBRUARY	-	-	2.07	3
MARCH	-	-	1.95	4
APRIL	-	-	2.47	3
MAY	-	-	3.75	2
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

WELL PW-3 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY	-	-	5.53	28
MARCH	-	-	3.19	25
APRIL	-	-	3.5	10
MAY		NO DATA		
JUNE		NO DATA		
JULY	-	-	5.77	3
AUGUST	-	-	5.13	6
SEPTEMBER	-	-	5.55	2
OCTOBER	-	-	5.67	3
NOVEMBER	-	-	5.9	1
DECEMBER	-	-	6.08	4

WELL TW-2 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST	-	-	6.46	13
SEPTEMBER	-	-	7.64	30
OCTOBER	-	-	9.1	31
NOVEMBER	-	-	10.16	30
DECEMBER	-	-	10.4	10

WELL TW-2 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL	-	-	4.9	3
MAY	-	-	4.75	11
JUNE	-	-	5.96	9
JULY	-	-	8.28	22
AUGUST	-	-	7.65	15
SEPTEMBER	-	-	9.4	30
OCTOBER	-	-	11.19	31
NOVEMBER	-	-	12.13	14
DECEMBER		NO DATA		

WELL TW-2 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL	-	-	4.85	6
MAY	-	-	4.78	6
JUNE	-	-	4.81	17
JULY	-	-	5.33	29
AUGUST	-	-	5.9	2
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

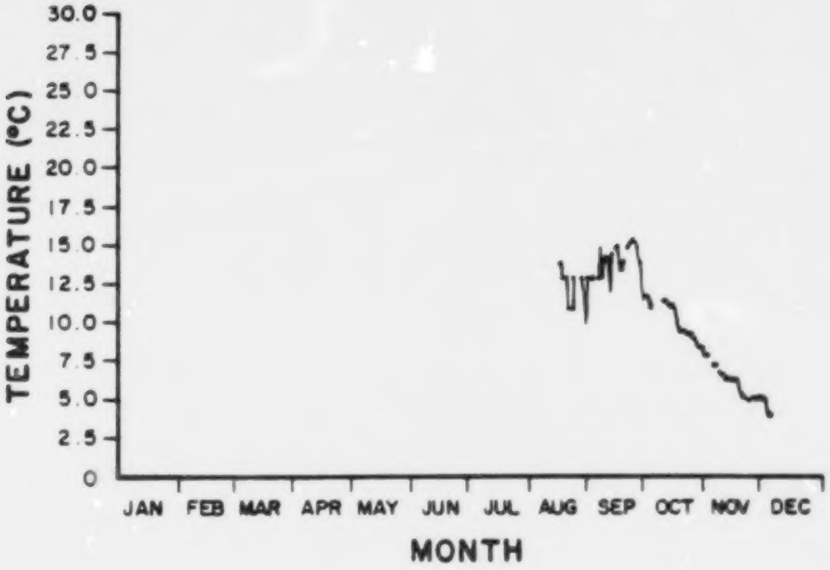
WELL TW-2 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH	-	-	2.4	4
APRIL	-	-	2.8	2
MAY	-	-	3.75	22
JUNE	-	-	3.7	22
JULY	-	-	4.37	20
AUGUST	-	-	5.6	2
SEPTEMBER	-	-	6.9	2
OCTOBER	-	-	8.97	3
NOVEMBER	-	-	10	1
DECEMBER	-	-	3.9	4

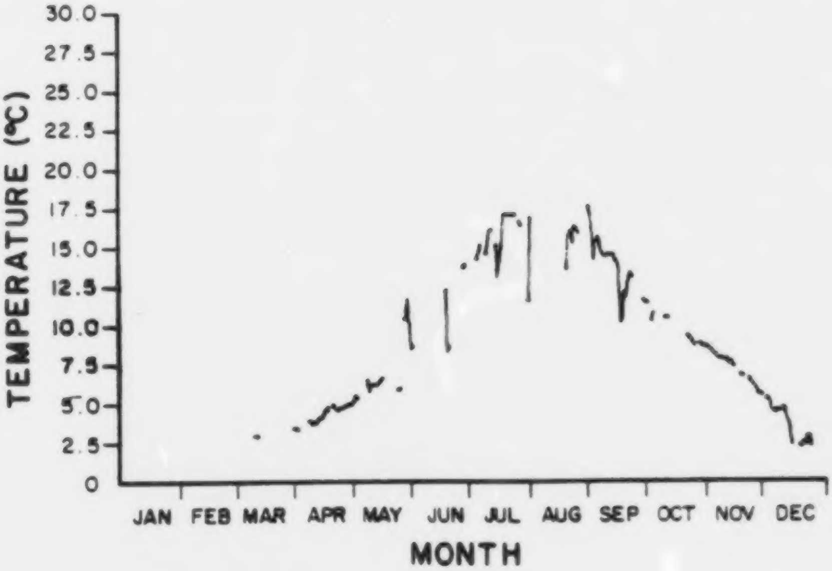
WELL TW-2 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	2.83	3
FEBRUARY	-	-	2.7	3
MARCH	-	-	2.85	4
APRIL	-	-	2.47	3
MAY	-	-	3.75	2
JUNE	NO DATA			
JULY	NO DATA			
AUGUST	NO DATA			
SEPTEMBER	NO DATA			
OCTOBER	NO DATA			
NOVEMBER	NO DATA			
DECEMBER	NO DATA			

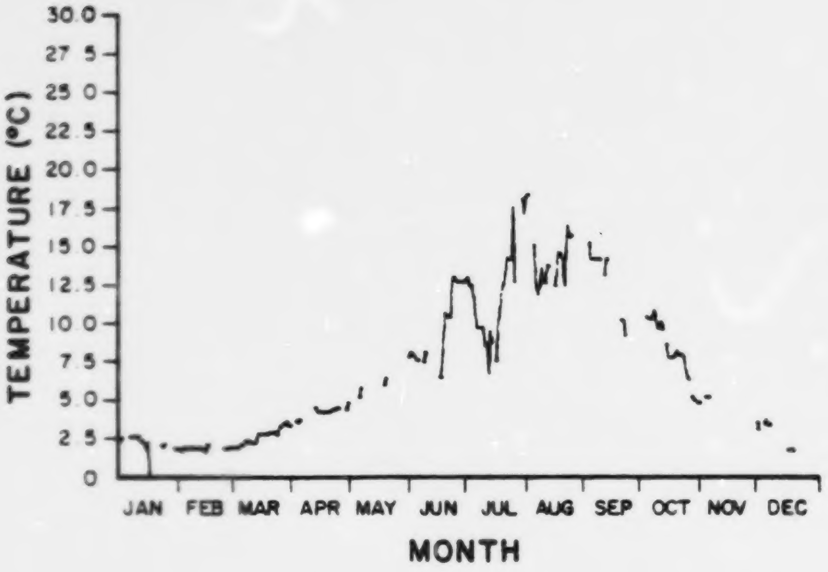
Quesnel River 1982



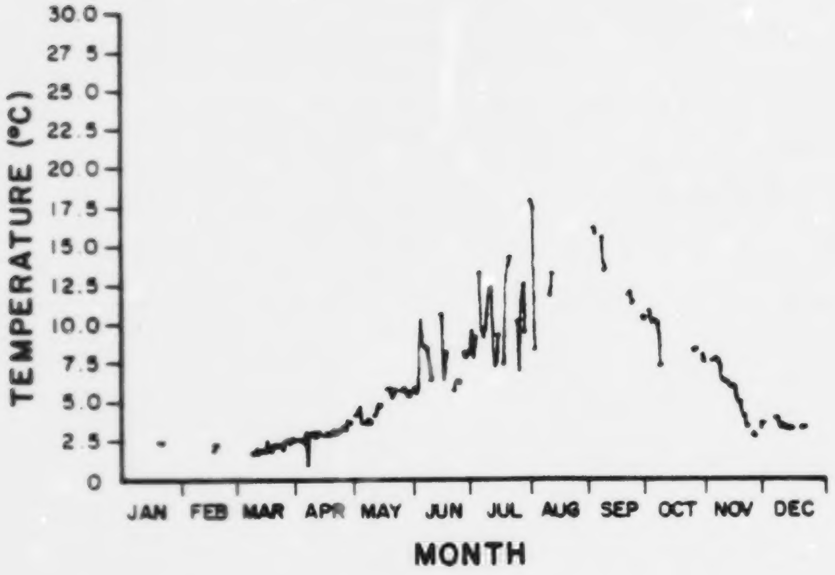
Quesnel River 1983



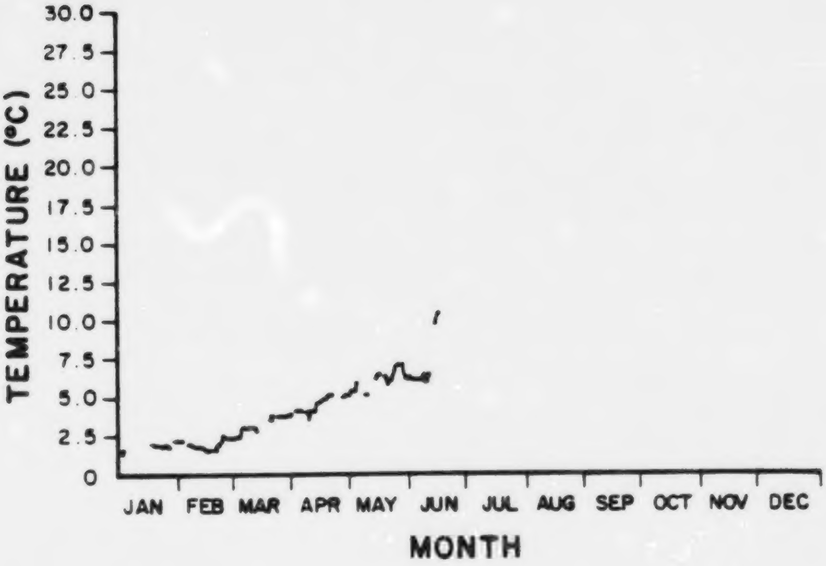
Quesnel River 1984



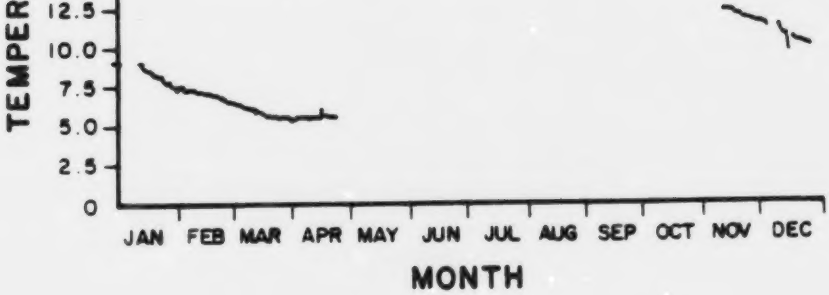
Quesnel River 1985

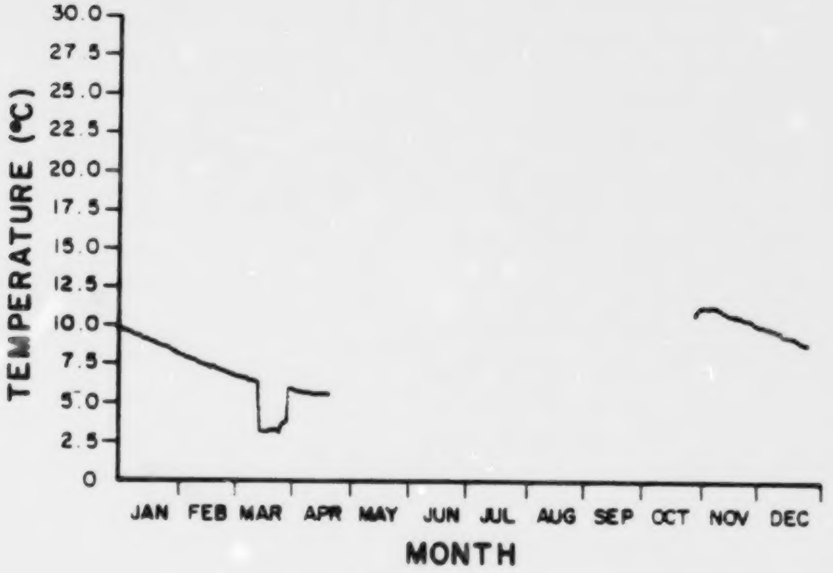


Quesnel River 1986

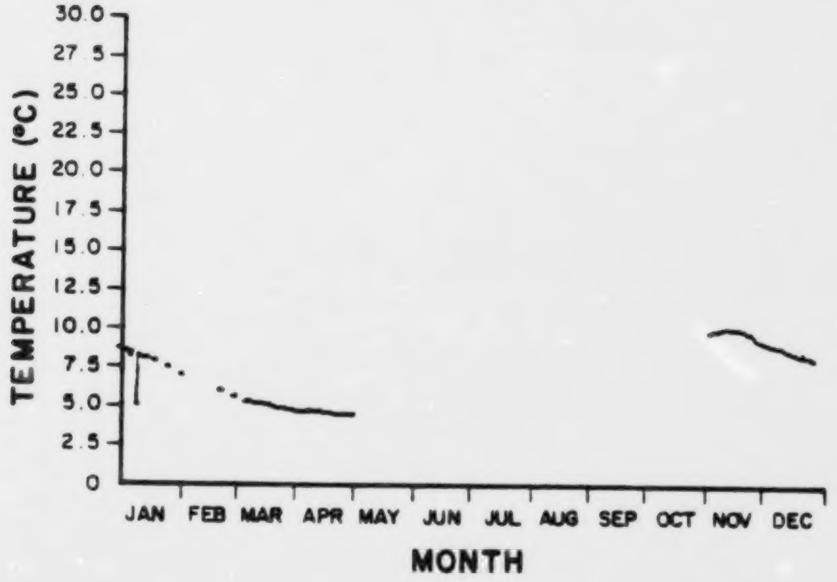


Well PW-1 1983



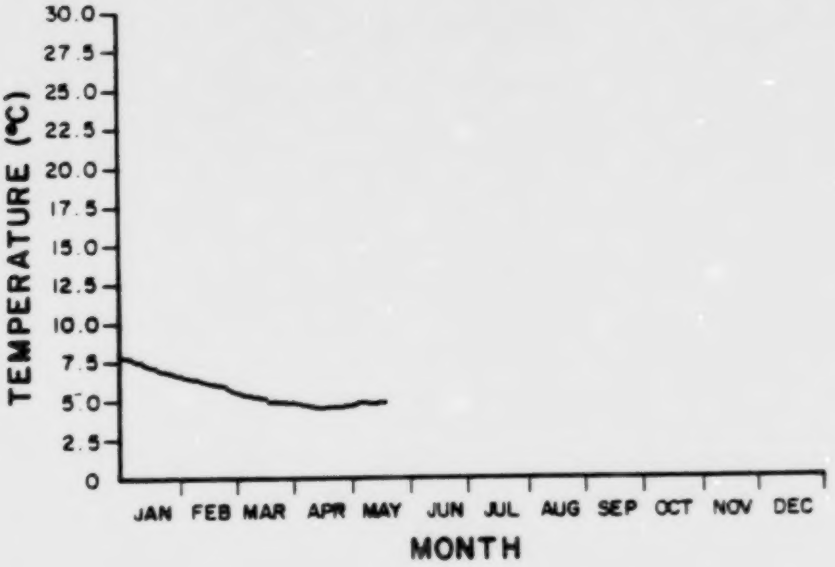


Well PW-1 1984

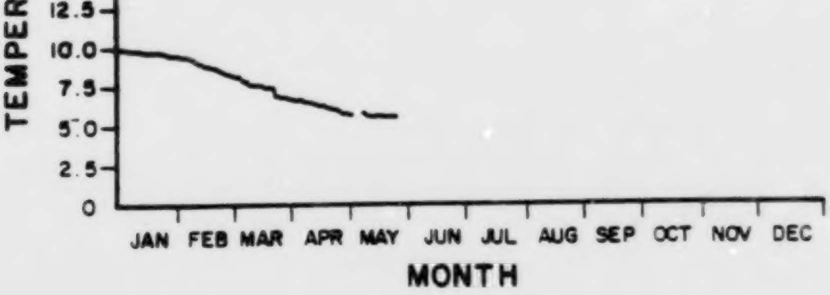


Well PW-1 1985

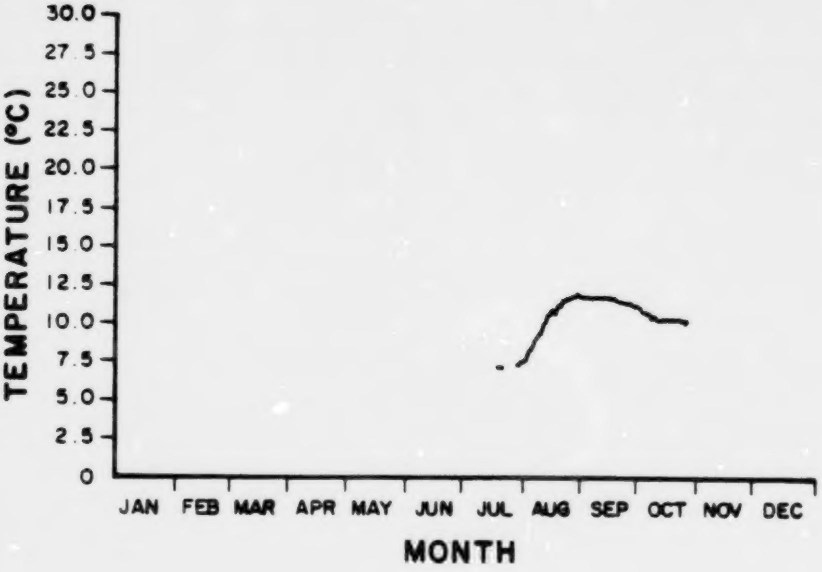
Well PW-1 1986



Well PW-2 1981



Well PW-2 1984



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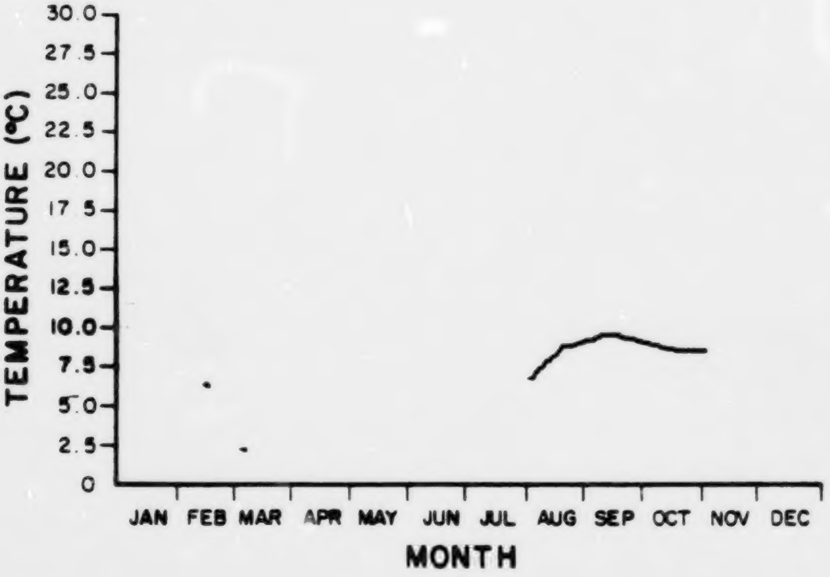
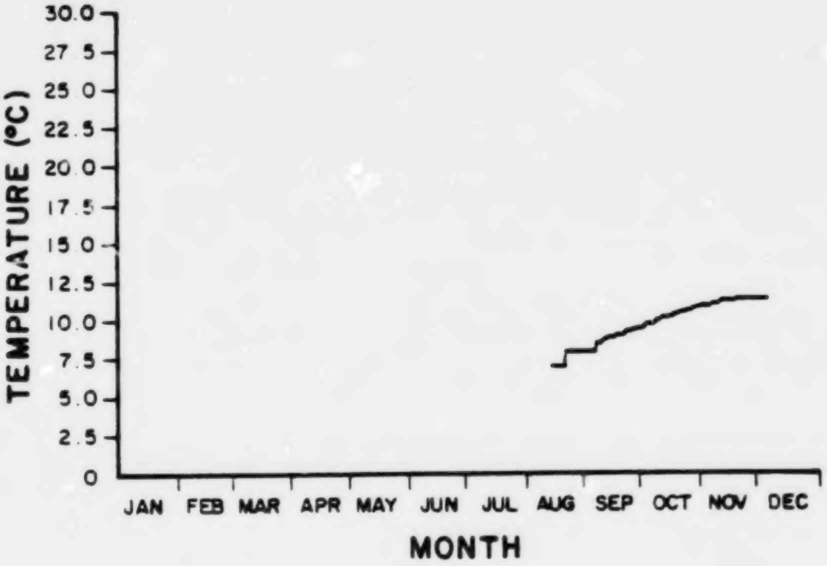
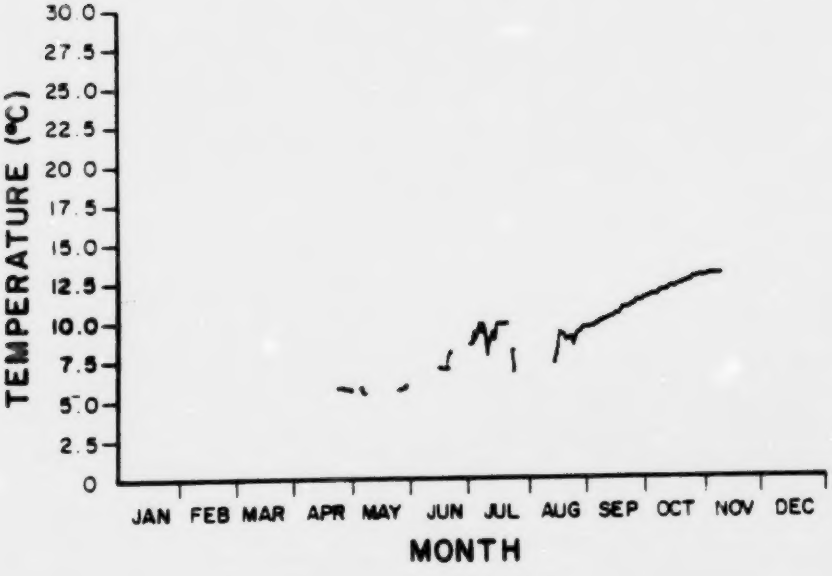


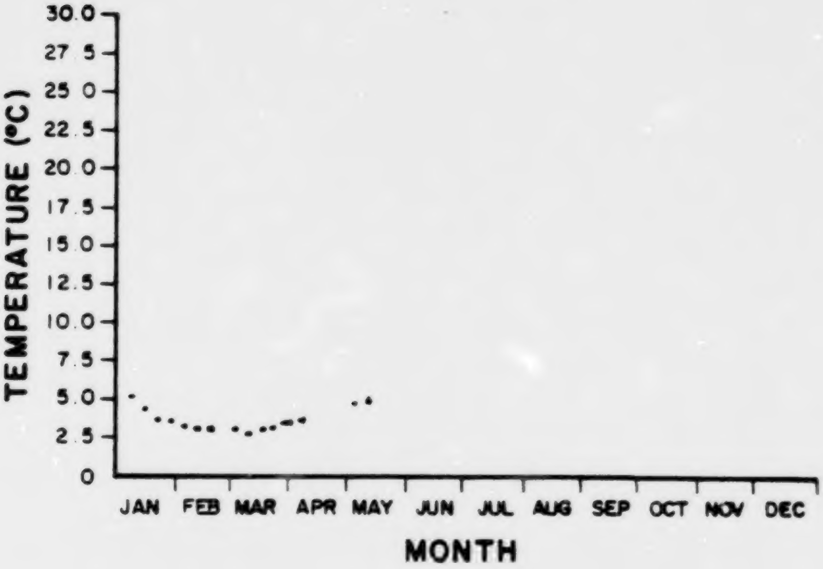
Well TW-2 1982



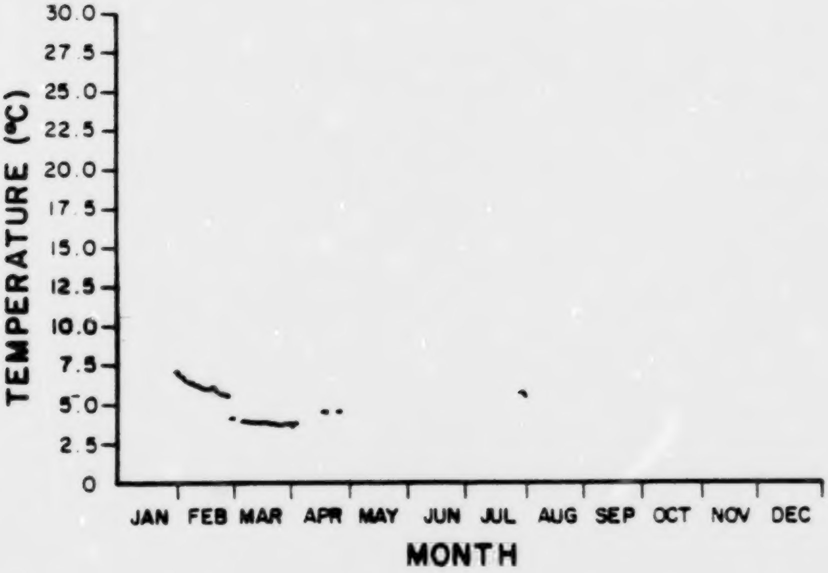
Well TW-2 1983



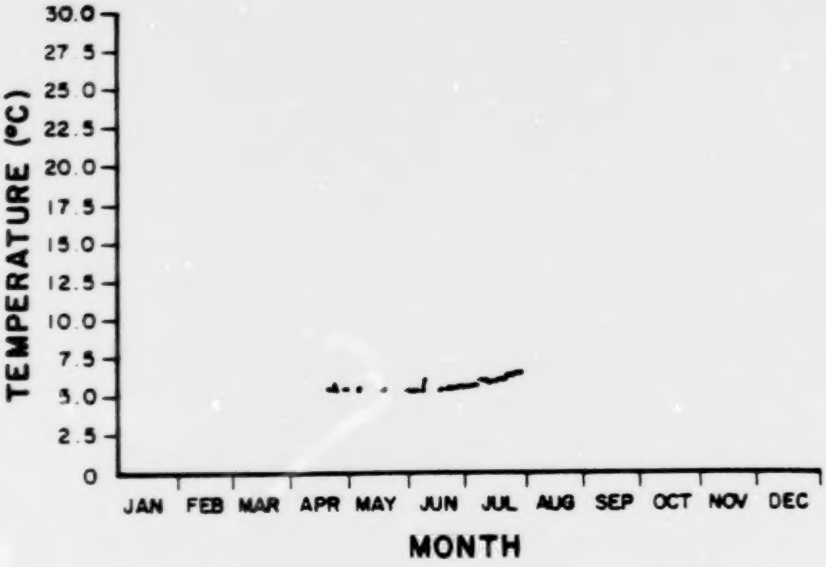
Well PW-2 1986



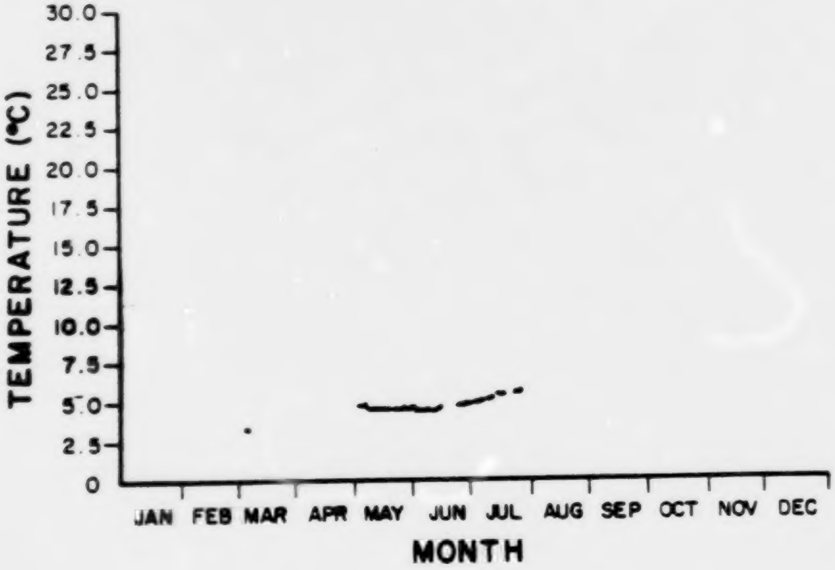
Well PW-3 1985



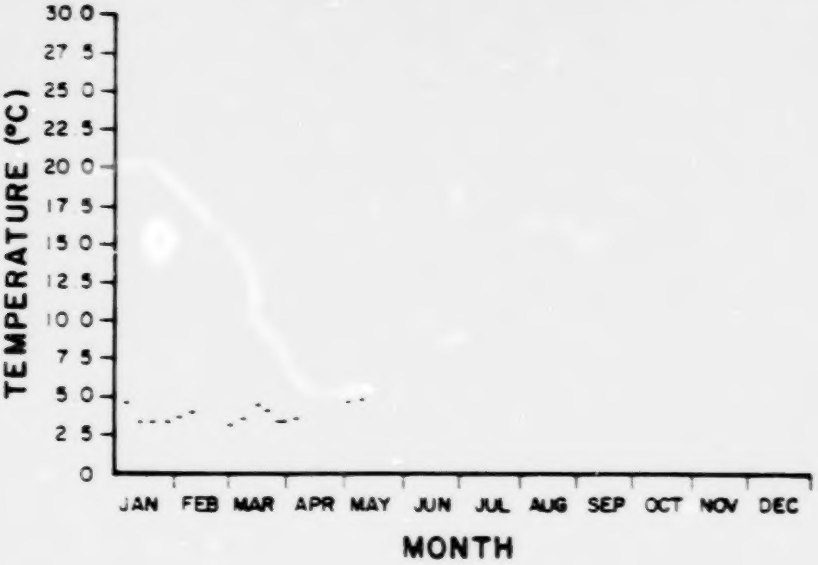
Well TW-2 1984



Well TW-2 1985



Well TW-2 1986



Facility: QUINSAM

Location:
Located 5 km west of the Campbel
coast of Vancouver Island.

Description:
Built to enhance Quinsam Tyee Ch
in 1974. Additional rearing troughs and
to 1984.
Egg production targets in 1985 w
chinook, 7 M pink and 75 K steelhead. Eg
Campbell River, Quinsam River, Black Cree
Eve River. Juveniles are released into Q
Menzies Creek, Welch Creek, Casey Creek,
Salmon River, Quinsam Lake, Iron Creek an

Water Sources:

Surface. Water from the Quinsam Rive
hatchery.

Groundwater. There are no wells, but
water from Cold Creek dam, which is sprin

General Water Quality:
The water is of good quality. T
by mixing the water supplies.

Special Notes:
Water temperatures for Cold Creek
taken directly from the creek from 1970 to
temperatures were taken after aeration.

WATER QUALITY VALUES FOR QUINSAM
(below detection limits = 0)

PARAMETERS	JAN04/84 QUINSAM RIVER	JAN04/84 QUINSAM RIVER	FEB21/84 QUINSAM RIVER	FEB21/84 QUINSAM RIVER	MAR20/84 QUINSAM RIVER	MAR20/84 QUINSAM RIVER	APR17/84 QUINSAM RIVER	APR17/84 QUINSAM RIVER	MAY15/84 QUINSAM RIVER	MAY15/84 QUINSAM RIVER	JUN26/84 QUINSAM RIVER
Alkalinity	11.5		13		14.5		16		18		23
Ammonia	.021		0		0		.006		.008		0
CO2											
Chloride	2.2		1.4		1.4		1.2		1.3		1.5
Color											
Conductivity Field	38.6		37.9		40.6		43.8		45.2		51
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat	0	0	0	0	0	0	0	0	0	0	0
Dissolved Gas Tot	0	0	0	0	0	0	0	0	0	0	0
Dissolved Nitrogen	0	0	0	0	0	0	0	0	0	0	0
Hardness	23.9	24.3	16.5	16.6	17.8	17.8	19.4	19.2	21.5	21.6	24.9
Nitrite	.006		0		0		0		0		0
Nitrate	.35		.14		.08		.06		.06		.01
pH-Field	6.8		7.1		7		7.2		7.2		7.4
pH-Lab											
Phosphate	.107		.008		.008		.006		.016		.007
Residue Filterable	45		43		39		40		40		40
Residue Non-Filter	139		6		6		0		13		0
Silica	4	3.9	2.6	2.8	3.2	3.2	3.1	3.1	3.3	3.3	0
Sulphate	2.9		2.1		2.8		2.4		2.8		2
Taste											
Temperature	0	0	0	0	0	0	0	0	0	0	0
Turbidity											
METALS—											
Al-Aluminum	.85	.8	.12	.12	.14	.14	.09	.08	.21	.21	0
As-Arsenic											
Ba-Barium											
Ca-Calcium	5	5	4.8	4.8	5.2	5.2	5.8	5.8	6.1	6.1	7.9
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt											
Cr-Chromium											
Cu-Copper	.008	.008	0	0	0	0	0	0	.002	.002	0
Fe-Iron	1.01	.987	.171	.172	.198	.204	.135	.134	.351	.345	.189
Hg-Mercury											
K—Potassium	0	0	.13	.13	.12	.12	.11	.11	.12	.13	.19
Mg-Magnesium	1.2	1.2	.9	.8	.9	.8	1	1	1.1	1.1	1.3
Mn-Manganese	.063	.058	.008	.008	.01	.01	.007	.006	.019	.018	.009
Mo-Molybdenum											
Na-Sodium	1.6	1.6	1.4	1.4	1.3	1.3	1.7	1.6	1.9	1.9	2.2
Ni-Nickle											
P—Phosphorus											
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony											
Se-Selenium											
Si-Silicon											
Sn-Tin											
Sr-Strontium											
Ti-Titanium											
V—Vanadium											
Zn-Zinc	.003	.002	0	0	0	.003	.019	.008	0	0	0

WATER QUALITY VALUES FOR QUINSAM
(below detection limits = 0)

PARAMETERS	JUN26/84 QUINSAM RIVER	JUL24/84 QUINSAM RIVER	JUL24/84 QUINSAM RIVER	AUG21/84 QUINSAM RIVER	AUG21/84 QUINSAM RIVER	SEP25/84 QUINSAM RIVER	SEP25/84 QUINSAM RIVER	OCT24/84 QUINSAM RIVER	OCT24/84 QUINSAM RIVER	NOV27/84 QUINSAM RIVER	NOV27/84 QUINSAM RIVER
Alkalinity		31		28		23		20		14.9	
Ammonia		.007		.007		0		0		.009	
CO2											
Chloride		2.6		3.6		1.1		2.4		1.7	
Color											
Conductivity Field		78.2		74.4		59.3		55.8		42	
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat	0	0	0	0	0	0	0	0	0	0	0
Dissolved Gas Tot	0	0	0	0	0	0	0	0	0	0	0
Dissolved Nitrogen	0	0	0	0	0	0	0	0	0	0	0
Hardness	25	32.6	32.2	30.2	30.8	23.9	24	24.8	24.5	19.7	20.1
Nitrite		0		0		0		0		.005	
Nitrate		.04		.03		.02		.1		.17	
pH-Field		7.4		7		7.4		7.3		6.8	
pH-Lab											
Phosphate		.005		.002		.002		.008		.016	
Residue Filterable		56		60		47		53		43	
Residue Non-Filter		0		0		0		5		.14	
Silica	3	3.7	3.7	3.3	3.4	2.3	2.3	3.2	3.2	3.4	3.5
Sulphate		3		2		3		3		3	
Taste											
Temperature	0	0	0	0	0	0	0	0	0	0	0
Turbidity											
METALS--											
Al-Aluminum	0	0	0	0	0	0	0	.16	.18	.26	.3
As-Arsenic											
Ba-Barium											
Ca-Calcium	7.9	9.6	9.5	9.2	9.2	7.7	7.7	7.2	7.2	5.4	5.4
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt											
Cr-Chromium											
Cu-Copper	0	0	0	0	0	.001	.001	0	0	.001	.002
Fe-Iron	.191	.186	.182	.139	.208	.089	.089	.319	.306	.321	.346
Hg-Mercury											
K--Potassium	.19	.21	.21	.22	.22	.14		.24	.23	.15	.15
Mg-Magnesium	1.3	1.9	1.9	1.7	1.7	1.1	1.1	1.3	1.2	1	1
Mn-Manganese	0	.006	.007	.007	.021	.004	.004	.01	.01	.015	.015
Mo-Molybdenum											
Na-Sodium	2.1	3.2	0	2.8	2.6	1.6	1.5	1.6	1.8	1.5	1.5
Ni-Nickle											
P--Phosphorus											
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony											
Se-Selenium											
Si-Silicon											
Sn-Tin											
Sr-Strontium											
Ti-Titanium											
V--Vanadium											
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR QUINSAM
(below detection limits = 0)

PARAMETERS	DEC19/84 QUINSAM RIVER	DEC19/84 QUINSAM RIVER	JAN29/85 QUINSAM RIVER	JAN29/85 QUINSAM RIVER	FEB26/85 QUINSAM RIVER	FEB26/85 QUINSAM RIVER	MAR20/85 QUINSAM RIVER	MAR20/85 QUINSAM RIVER	APR24/85 QUINSAM RIVER	APR24/85 QUINSAM RIVER	MAY14/85 QUINSAM RIVER
Alkalinity	16.8		18.7		17.1		19.9		18.5		22.4
Ammonia	.011		.005		.006		0		.009		
CO2											
Chloride	2.3		1.9		1.4		1.6		1.7		
Color											
Conductivity Field	44		50		47.5		50		50		
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat	0	0									
Dissolved Gas Tot	0	0									
Dissolved Nitrogen	0	0									
Hardness	19	19	20.7	20.6	20	20	19.6	19.7	22	22	23.9
Nitrite	0		0		0		0		0		
Nitrate	.12		.12		.15		.1		.073		
pH-Field	7.2		7.2		7.2		7.4		7.8		7.3
pH-Lab											
Phosphate	.007		.005		.007		.005		.012		
Residue Filterable	42		44		40		42		47		44
Residue Non-Filter	0		0		0		0		0		0
Silica	3.3	3.3	.7	.7	3.3	3.3	3.2	3.2	3.4	3.4	3.1
Sulphate	2		3		3		2		3		
Taste											
Temperature	0	0									
Turbidity											
METALS--											
Al-Aluminum	.09	.09	.07	.05	.09	.09	0	0	.11	.12	0
As-Arsenic											
Ba-Barium											
Ca-Calcium	5.6	5.5	6.1	6.1	5.9	5.9	5.8	5.6	6.4	6.4	7.4
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt											
Cr-Chromium											
Cu-Copper	0	0	0	0	0	0	0	0	0	0	0
Fe-Iron	.152	.157	.156	.157	.133	.134	.152	.169	.218	.214	.153
Hg-Mercury											
K--Potassium	.11		.06	.11	.07	.07	.12	.13	.16	.18	.16
Mg-Magnesium	1.1	1.1	1.2	1.2	1.1	1.1	1.1	1.1	1.2	1.2	1.2
Mn-Manganese	.007	.007	.006	.006	.005	.006	.006	.006	.008	.008	.008
Mo-Molybdenum											
Na-Sodium	1.6	1.5	1.8	1.8	1.7	1.7	1.9	1.9	2	2	1.8
Ni-Nickle											
P--Phosphorus											
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony											
Se-Selenium											
Si-Silicon											
Sn-Tin											
Sr-Strontium											
Ti-Titanium											
V--Vanadium											
Zn-Zinc	0	0	0	0	.005	0	0	0	0	0	0

WATER QUALITY VALUES FOR QUINSAM

(below detection limits = 0)

PARAMETERS	MAY14/85 QUINSAM RIVER	JUL17/85 QUINSAM RIVER	JUL17/85 QUINSAM RIVER	AUG21/85 QUINSAM RIVER	AUG21/85 QUINSAM RIVER	SEP18/85 QUINSAM RIVER	SEP18/85 QUINSAM RIVER	NOV19/85 QUINSAM RIVER	NOV19/85 QUINSAM RIVER	DEC17/85 QUINSAM RIVER	DEC17/85 QUINSAM RIVER
Alkalinity		33.9		35		24.7		21.3		19	
Ammonia		.007		.008		.007					
CO2											
Chloride		2.7		3.2		1.4		2.4		2.4	
Color											
Conductivity Field		80		93		80		55		55	
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	23.9	35.1	34.7	33.3	33.3	26.1	26.2	24	23.8	23.3	23.2
Nitrite		.007		0		0		0		0	
Nitrate		.046		.019		.01		.008		.007	
pH-Field		7.9		7.8		7		7.3		7.2	
pH-Lab											
Phosphate		.005		.003		.004		.002		.004	
Residue Filterable		49		55		33		49		43	
Residue Non-Filter		0		0		0		0		0	
Silica	3.2	2.7	2.7	2.2	2.2	1.4	1.4	2.4	2.4	2.7	2.7
Sulphate		2		2		2		3		3	
Taste											
Temperature											
Turbidity											
METALS--											
Al-Aluminum	0	0	0	0	0	0	0	0	0	.1	0
As-Arsenic											
Ba-Barium											
Ca-Calcium	7.4	10.6	10.5	10.1	10.1	8.5	8.5	7.4	7.3	6.9	6.9
Cd-Cadmium	0	0	0	.0014	0	0	0	0	0	0	0
Co-Cobalt											
Cr-Chromium											
Cu-Copper	0	.001	0	0	0	.002	0	0	0	0	0
Fe-Iron	.158	.231	.227	.18	.181	.097	.097	.185	.191	.223	.226
Hg-Mercury											
K—Potassium	.16	.23	.23	.27	.27	.13	.14	.16	.16	.18	.16
Mg-Magnesium	1.2	1.9	1.9	1.9	1.8	1.2	1.2	1.2	1.2	1.2	1.2
Mn-Manganese	.008	.009	.009	.006	.006	.01	.01	.008	.008	.007	.007
Mo-Molybdenum											
Na-Sodium	1.9	2.9	2.9	2.8	2.8	1.7	1.7	1.8	1.8	2	0
Ni-Nickle											
P—Phosphorus											
Pb-Lead	0	0	0	.003	0	0	0	0	0	0	0
Sb-Antimony											
Se-Selenium											
Si-Silicon											
Sn-Tin											
Sr-Strontium											
Ti-Titanium											
V—Vanadium											
Zn-Zinc	0	0	0	0	0	0	0	0	0	0	0

WATER QUALITY VALUES FOR QUINSAM
(below detection limits = 0)

PARAMETERS	JAN15/86 QUINSAM RIVER	JAN15/86 QUINSAM RIVER	APR17/84 COLD CREEK	APR17/84 COLD CREEK	AUG21/84 COLD CREEK	AUG21/84 COLD CREEK	DEC19/84 COLD CREEK	DEC19/84 COLD CREEK	MAR20/85 COLD CREEK	MAR20/85 COLD CREEK	AUG21/85 COLD CREEK
Alkalinity	14.8										
Ammonia											
CO2											
Chloride	1.3										
Color											
Conductivity Field											
Conductivity Lab											
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness		20.6	40.2	40.2	48.6	48.3	43.2	43.4	44.2	44.4	45.3
Nitrite	0										
Nitrate	.153										
pH-Field	7.3										
pH-Lab											
Phosphate	.018										
Residue Filterable	39										
Residue Non-Filter	16										
Silica	2.9	2.9	5.4	5.4	5.7	5.8	5.7	5.6	5.7	5.7	3.3
Sulphate	3										
Taste											
Temperature											
Turbidity											
METALS—											
Al-Aluminum	.31	.32	0	0	0	0	.11	.12	0	0	0
As-Arsenic											
Ba-Barium											
Ca-Calcium	5.6	5.6	11.3	11.3	14	13.9	11.6	11.6	12.1	12.1	13.3
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt											
Cr-Chromium											
Cu-Copper	.001	.002	0	0	0	0	0	0	0	0	0
Fe-Iron	.336	.337	.092	.094	.064	.058	.176	.189	.116	.117	.126
Hg-Mercury											
K—Potassium	.21	.21	.39	0	.42	.41			.42	.41	.39
Mg-Magnesium	.9		2.8	2.8	3.3	3.3	3.2	3.2	3.4	3.3	2.8
Mn-Manganese	.017	.016	.007	.012	.006	.005	.011	.012	.01	.01	.008
Mo-Molybdenum											
Na-Sodium	1.3	1.2	2.9	2.9	2.2	2.2	2.5	2.5	2.8	2.7	2
Ni-Nickle											
P—Phosphorus											
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony											
Se-Selenium											
Si-Silicon											
Sn-Tin											
Sr-Strontium											
Ti-Titanium											
V—Vanadium											
Zn-Zinc	0	0	0	.033	0	0	0	.003	0	0	0

WATER QUALITY VALUES FOR QUINSAM
(below detection limits = 0)

PARAMETERS	AUG21/85 COLD CREEK	DEC17/85 COLD CREEK	DEC17/85 COLD CREEK
Alkalinity			
Ammonia			
CO2			
Chloride			
Color			
Conductivity Field			
Conductivity Lab			
Dissolved O2-ppm			
Dissolved O2-%sat			
Dissolved Gas Tot			
Dissolved Nitrogen			
Hardness	45.1	48.3	48.9
Nitrite			
Nitrate			
pH-Field			
pH-Lab			
Phosphate			
Residue Filterable			
Residue Non-Filter			
Silica	3.2	5.1	5.1
Sulphate			
Taste			
Temperature			
Turbidity			
METALS—			
Al-Aluminum	0	.12	.11
As-Arsenic			
Ba-Barium			
Ca-Calcium	13.2	13.3	13.4
Cd-Cadmium	0	0	0
Co-Cobalt			
Cr-Chromium			
Cu-Copper	0	0	0
Fe-Iron	.128	.185	.178
Hg-Mercury			
K—Potassium	.43	.45	.45
Mg-Magnesium	2.8	3.4	3.5
Mn-Manganese	.008	.012	.012
Mo-Molybdenum			
Na-Sodium	2	2.7	2.8
Ni-Nickle			
P—Phosphorus			
Pb-Lead	0	0	0
Sb-Antimony			
Se-Selenium			
Si-Silicon			
Sn-Tin			
Sr-Strontium			
Ti-Titanium			
V—Vanadium			
Zn-Zinc	0	0	0

QUINSAM RIVER 1977

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST	13.25	22.5	17.68	14
SEPTEMBER	11.25	16.75	14.12	30
OCTOBER	7.75	13	9.53	26
NOVEMBER	.25	8.25	4.22	22
DECEMBER	.5	4	1.94	28

QUINSAM RIVER 1978

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.1	2.5	.95	25
FEBRUARY	.25	6	-.96	28
MARCH	.5	7.5	4.57	22
APRIL	3.75	14	7.41	30
MAY	6	20	12.89	31
JUNE	8.25	21.5	14.23	29
JULY	15	23	18.6	31
AUGUST	14	22.75	17.24	31
SEPTEMBER	11	17.25	13.58	30
OCTOBER	7.5	13	10.31	31
NOVEMBER	.25	9.25	4.71	30
DECEMBER	.25	4	2.14	27

QUINSAM RIVER 1979

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	1	.33	30
FEBRUARY	.01	1.5	.74	27
MARCH	1	6.75	3.67	31
APRIL	4.75	14	7.76	27
MAY	9.25	16.5	12.65	31
JUNE	13	20.75	16.33	30
JULY	14.25	23	18.02	31
AUGUST	15.25	20.75	17.78	31
SEPTEMBER	12.5	17.5	15.2	30
OCTOBER	8	14	11.14	31
NOVEMBER	3.25	9.25	5.91	30
DECEMBER	2.75	5.75	3.95	31

QUINSAM RIVER 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	0	4.75	1.57	25
FEBRUARY	.5	4.75	2.17	26
MARCH	.25	6	3.94	31
APRIL	5.75	12.5	8.59	30
MAY	10.5	17.75	13.74	28
JUNE	12.75	20	19.52	27
JULY	13.75	22.25	17.86	31
AUGUST	13.5	22	13.3	30
SEPTEMBER	13.25	17.25	14.85	30
OCTOBER	7.25	14.75	10.93	31
NOVEMBER	3.5	10.25	7.61	30
DECEMBER	.75	5.75	3.48	27

QUINSAM RIVER 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.25	5.75	4.18	31
FEBRUARY	.5	5.5	.17	28
MARCH	4.5	8.25	6.32	31
APRIL	6.25	10.75	8.56	29
MAY	9.25	15.5	12.33	31
JUNE	12.25	17.5	14.07	30
JULY	14.25	20.25	17.35	31
AUGUST	13.75	21.25	17.44	28
SEPTEMBER	11.75	16.75	14.86	26
OCTOBER	9	11.75	10.67	19
NOVEMBER	4.75	9.5	3.04	25
DECEMBER	1	5.5	3.35	31

QUINSAM RIVER 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.25	2	1.36	23
FEBRUARY	1	2.75	2.04	27
MARCH	2	6.75	4.09	31
APRIL	4.5	10.75	7.28	29
MAY	8.5	16.5	12.06	31
JUNE	13.25	21.25	17.34	28
JULY	15	20.25	17.16	31
AUGUST	14.25	18.25	16.15	27
SEPTEMBER	11.75	17.75	15.23	30
OCTOBER	7.25	13	10.49	31
NOVEMBER	5.75	8.75	7.42	9
DECEMBER	1.25	5.75	3.46	30

QUINSAM RIVER 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.5	5	3.52	29
FEBRUARY	1.75	5.25	3.48	12
MARCH		NO DATA		
APRIL	9.25	15.25	11.58	12
MAY	9	21	14.37	29
JUNE	13.5	18.5	15.35	21
JULY	14	20.5	17.42	19
AUGUST	14.5	20.4	16.89	31
SEPTEMBER	8.8	17.7	13.68	29
OCTOBER	7.3	11.4	8.97	29
NOVEMBER	3.1	8.9	6.75	26
DECEMBER	-.1	4	2.19	19

QUINSAM RIVER 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-.3	3.3	1.73	31
FEBRUARY	1.9	5.5	3.53	20
MARCH	3.3	10.4	6.09	30
APRIL	6.8	14	9.53	23
MAY	8.4	15.5	11.33	29
JUNE	12.5	19.5	15.58	28
JULY	13	20.7	17.03	31
AUGUST	13	20	16.14	26
SEPTEMBER	10.1	15.5	13.3	30
OCTOBER	3.1	13.3	9.35	31
NOVEMBER	-1	3.4	1.78	16
DECEMBER	.4	3.6	2.1	31

QUINSAM RIVER 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.4	4.4	1.79	31
FEBRUARY	.65	4.1	2.13	25
MARCH	2.7	6.3	4.33	31
APRIL	3.8	9.3	6.79	28
MAY	8	17.7	12.88	26
JUNE	13.9	19.75	16.39	29
JULY	14.3	22	18.64	26
AUGUST	13.7	19.4	16.42	31
SEPTEMBER	10.6	17.6	13.77	30
OCTOBER	7.4	13.3	9.8	29
NOVEMBER	0	8.1	3.03	30
DECEMBER	-1	3.1	1.28	31

QUINSAM RIVER 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	1	3.5	2.54	31
FEBRUARY	.4	4	2.26	22
MARCH	1.5	5.5	4.16	16
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

COLD CREEK 1970

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH	8.61	10.28	9.47	9
APRIL	8.61	11.39	10	30
MAY	9.44	12.22	10.59	31
JUNE	10	13.06	11.61	30
JULY	10.28	13.06	11.54	22
AUGUST	10.56	12.78	11.68	31
SEPTEMBER	10.28	12.22	11.18	30
OCTOBER	8.89	11.67	10.45	22
NOVEMBER	6.67	10	8.33	26
DECEMBER	3.33	8.33	6.26	31

COLD CREEK 1971

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	4.17	7.78	6.46	31
FEBRUARY	5.56	8.06	6.69	22
MARCH	4.44	9.17	7.06	31
APRIL	6.94	11.39	8.88	24
MAY	8.61	11.67	9.91	31
JUNE	8.61	11.67	10.11	30
JULY	9.44	11.94	10.66	31
AUGUST	9.44	11.67	10.35	31
SEPTEMBER	8.89	10.83	9.68	29
OCTOBER	8.33	10.28	9.17	31
NOVEMBER	6.94	8.89	7.84	30
DECEMBER	3.89	7.5	6.67	31

COLD CREEK 1972

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	5.83	7.5	6.88	24
FEBRUARY	3.33	7.78	6.38	28
MARCH	3.89	8.89	6.3	29
APRIL	5	10	8.09	29
MAY	8.33	12.5	9.99	20
JUNE	9.44	12.22	10.38	17
JULY	9.44	11.67	10.35	11
AUGUST	8.06	12.78	10.25	18
SEPTEMBER	7.78	12.5	10.9	24
OCTOBER	7.5	9.44	8.32	27
NOVEMBER	7.78	9.44	8.5	30
DECEMBER	5	8.61	7.19	31

COLD CREEK 1973

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	5	7.78	6.35	31
FEBRUARY	5.56	7.78	6.87	22
MARCH	5	8.61	6.97	31
APRIL	6.67	10	8.18	30
MAY	7.22	12.22	8.88	30
JUNE	9.44	12.22	10.62	28
JULY	9.72	12.5	10.83	31
AUGUST	9.44	12.22	10.67	31
SEPTEMBER	9.44	11.39	10.29	30
OCTOBER	8.61	10.56	9.54	31
NOVEMBER	5	9.72	7.68	30
DECEMBER	5.28	8.33	7.37	31

COLD CREEK 1974

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	5.28	8.33	7.14	31
FEBRUARY	6.11	9.17	7.57	28
MARCH	5.28	10	8.02	31
APRIL	7.78	11.67	9.4	28
MAY	8.33	11.94	10.12	26
JUNE	9.17	12.78	10.71	30
JULY	9.44	12.5	10.76	29
AUGUST	10	12.22	11.12	31
SEPTEMBER	9.72	11.94	10.54	21
OCTOBER	8.06	10.83	9.67	31
NOVEMBER	7.22	9.72	8.63	27
DECEMBER	6.67	8.89	7.87	31

COLD CREEK 1975

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	5.4	8.4	7.55	31
FEBRUARY	4.8	8.5	7.7	23
MARCH	4.2	9.66	7.76	31
APRIL	7.2	11.3	9.36	30
MAY	8.5	11.7	10.03	29
JUNE	9.2	11.9	10.33	30
JULY	9	12	10.72	26
AUGUST	9.3	11.4	10.21	31
SEPTEMBER	9.3	11	10.07	26
OCTOBER	7.1	10.2	9.31	30
NOVEMBER	6	102	8.77	30
DECEMBER	6.5	9.2	8.16	31

COLD CREEK 1976

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	6.5	9.2	8.3	31
FEBRUARY	7.4	9.3	8.62	28
MARCH	7	9.8	8.7	31
APRIL	8.2	12	9.82	30
MAY	9.6	11.9	10.57	14
JUNE	9.8	12.3	10.73	16
JULY	10	12.2	10.83	18
AUGUST	10.1	12.2	10.9	27
SEPTEMBER	10	11.3	10.7	30
OCTOBER	9.2	10.9	10.04	22
NOVEMBER	8.6	10.6	9.62	30
DECEMBER	8.8	10.1	9.4	20

COLD CREEK 1977

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	8.2	9.3	8.76	22
FEBRUARY	8	10.2	9.23	28
MARCH	7	10.9	8.93	30
APRIL	8.8	12.2	10.23	29
MAY	9.5	12	10.39	31
JUNE	9.4	12.3	10.97	15
JULY	9.8	12.8	10.89	28
AUGUST	9.9	12.2	10.95	31
SEPTEMBER	9.4	11.1	10.19	30
OCTOBER	9	10.2	9.59	31
NOVEMBER	6.8	9.4	8.38	29
DECEMBER	6.4	8.4	7.69	31

COLD CREEK 1978

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	6.8	8.9	7.95	31
FEBRUARY	6	9	7.99	28
MARCH	7.4	10.4	9	31
APRIL	8.6	11.5	9.74	26
MAY	9.1	12.2	10.35	29
JUNE	9.8	12.4	10.94	30
JULY	10	12.2	11.04	30
AUGUST	9.9	12	10.75	31
SEPTEMBER	9.4	11.1	10.31	30
OCTOBER	9	10.7	9.92	31
NOVEMBER	8.1	10	8.99	30
DECEMBER	6.2	9	8.15	31

COLD CREEK 1979

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3	9	8.1	31
FEBRUARY	5	8.8	7.47	27
MARCH	7.7	10.6	9.03	30
APRIL	8.2	11.8	9.92	30
MAY	9.2	11.9	10.41	30
JUNE	9.8	12.2	10.83	30
JULY	9.9	12.2	10.87	25
AUGUST	10	11.9	10.73	7
SEPTEMBER	9.4	10.9	10.16	21
OCTOBER	8.9	10.4	9.63	21
NOVEMBER	8.2	10.5	9.07	29
DECEMBER	7.5	9.3	8.38	26

COLD CREEK 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3	8.9	7.82	29
FEBRUARY	7.2	9.4	8.5	28
MARCH	7.7	10	8.81	27
APRIL	8.6	11.6	9.88	30
MAY	9.4	12	10.46	28
JUNE	9.6	12	10.64	27
JULY	10	12.2	10.85	31
AUGUST	10	11.9	10.8	31
SEPTEMBER	10	11.2	10.56	30
OCTOBER	9.7	11	10.27	31
NOVEMBER	-	-	9.74	30
DECEMBER	-	-	8.73	31

COLD CREEK 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	9.31	31
FEBRUARY	-	-	9.17	28
MARCH	-	-	9.53	31
APRIL	-	-	9.73	27
MAY	10.2	11.8	10.87	6
JUNE	9.8	12.1	10.66	30
JULY	9.8	12.2	10.91	21
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

COLD CREEK 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	6.3	9.2	8.18	31
FEBRUARY	6.6	9.1	8.13	28
MARCH	6.9	10.5	8.87	31
APRIL	5.3	11.6	9.49	30
MAY	9.3	12.2	10.3	31
JUNE	9.8	12.3	10.75	30
JULY	10.1	12.2	10.67	31
AUGUST	10	11.8	10.58	31
SEPTEMBER	9.9	11.3	10.49	30
OCTOBER	8	11	10.09	31
NOVEMBER	8.5	10.9	9.35	30
DECEMBER	5.3	10.2	8.76	31

COLD CREEK 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	5.1	10.2	8.9	31
FEBRUARY	1.8	9.8	8.85	28
MARCH	7.5	10.7	9.3	31
APRIL	8.6	12.2	10.16	29
MAY	9.7	12.1	10.61	31
JUNE	10.2	11.9	10.73	11
JULY	10.1	11.9	10.86	18
AUGUST		NO DATA		
SEPTEMBER	9.5	11.2	10.34	24
OCTOBER	9.5	10.8	10.06	31
NOVEMBER	8.3	10.6	9.59	30
DECEMBER	7.8	9.5	8.69	31

COLD CREEK 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	7	10.2	8.59	31
FEBRUARY	8	10.9	9.01	28
MARCH	8.3	10.7	9.48	31
APRIL	8.3	11.8	9.94	30
MAY	9.4	11.8	10.2	27
JUNE	9.7	12	10.61	30
JULY	10	12.1	10.78	31
AUGUST	10.2	12	10.7	31
SEPTEMBER	9.7	11.2	10.37	28
OCTOBER	8.6	10.9	9.98	31
NOVEMBER	6.9	10.5	8.98	30
DECEMBER	8.3	9.8	9.21	31

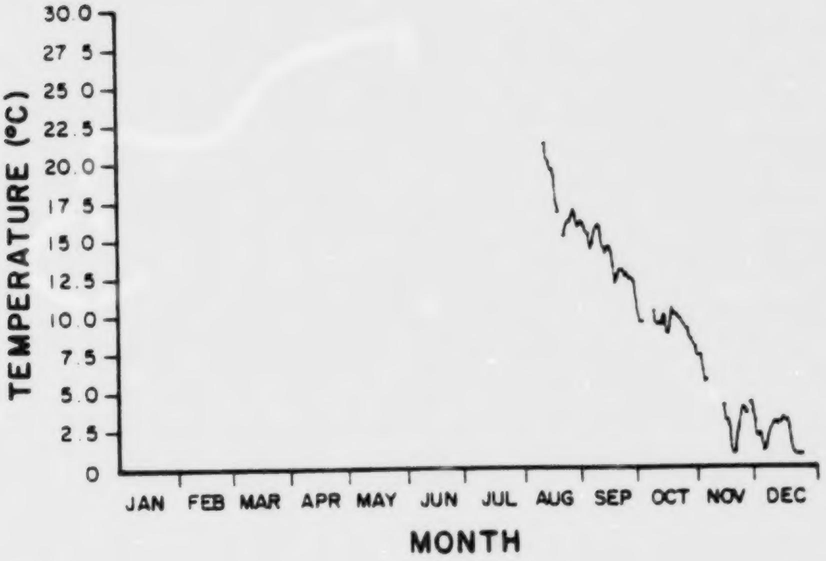
COLD CREEK 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	8.3	10.2	9.6	31
FEBRUARY	7.6	10.2	9.43	28
MARCH	7.4	10.7	9.5	31
APRIL	8.3	11.6	10	30
MAY	7.1	12	10.44	31
JUNE	9.8	12.2	10.47	30
JULY	10	12.2	10.69	31
AUGUST	9.9	11.6	10.46	31
SEPTEMBER	9.7	11.2	10.29	30
OCTOBER	9.6	10.8	10.13	31
NOVEMBER	8.1	10.2	9.14	30
DECEMBER	8.3	10.2	9.25	31

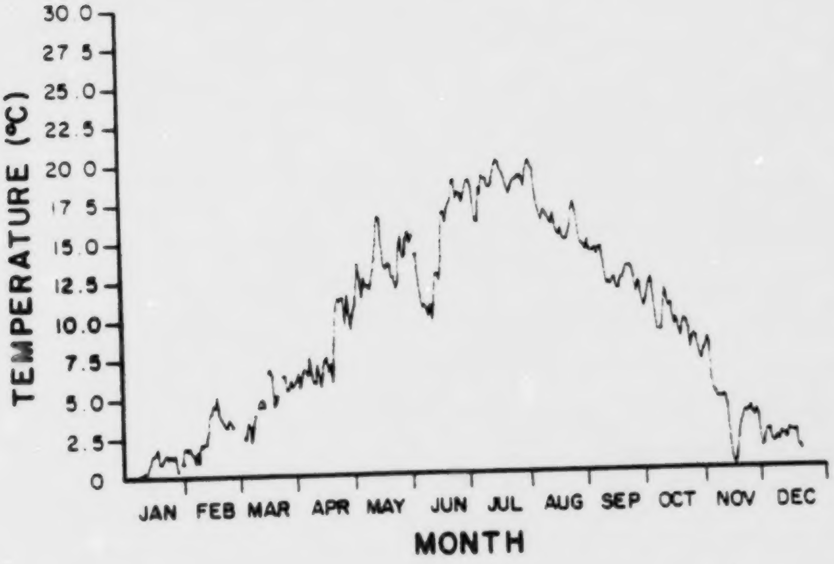
COLD CREEK 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	7.4	10.2	9.16	31
FEBRUARY	7.9	9.9	9.04	28
MARCH	8.3	10.4	9.54	17
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

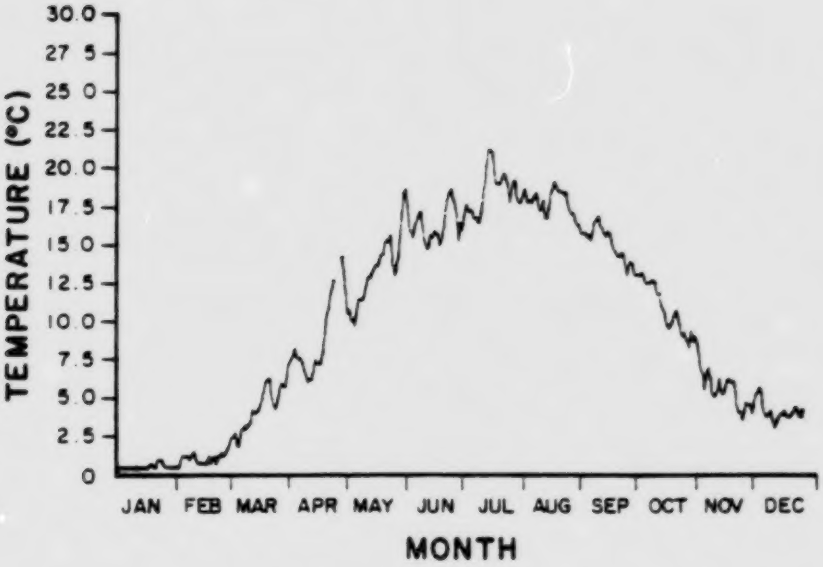
Quinsam River 1977



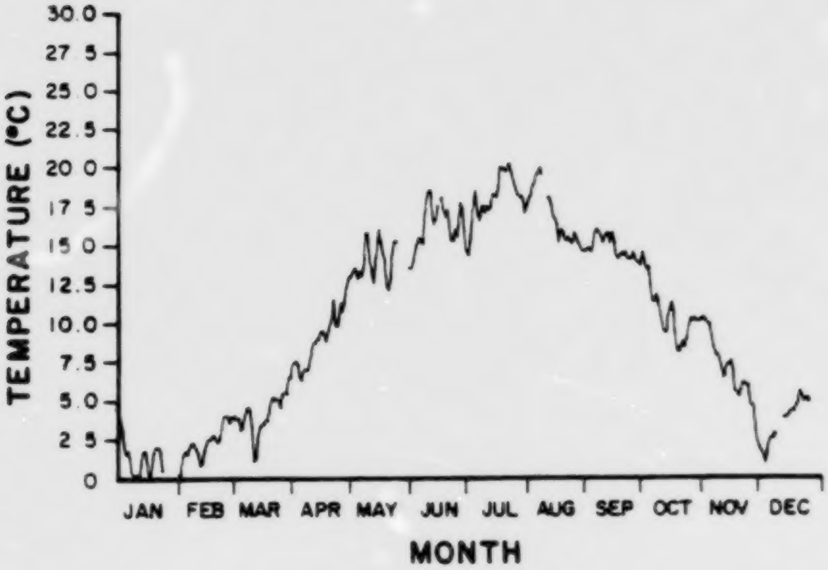
Quinsam River 1978



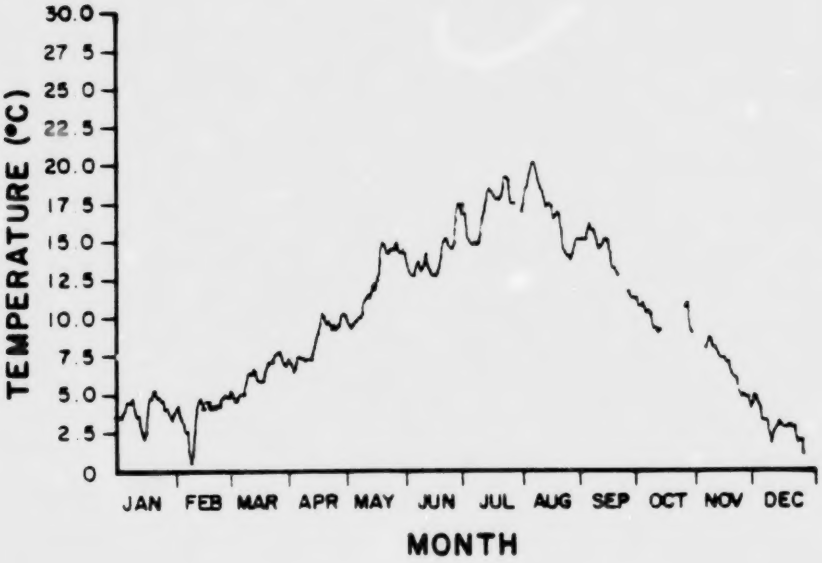
Quinsam River 1979



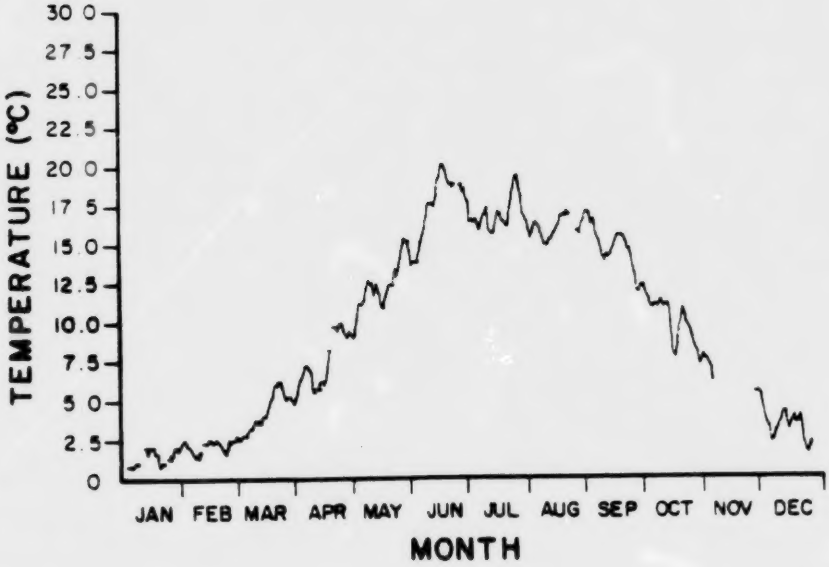
Quinsam River 1980



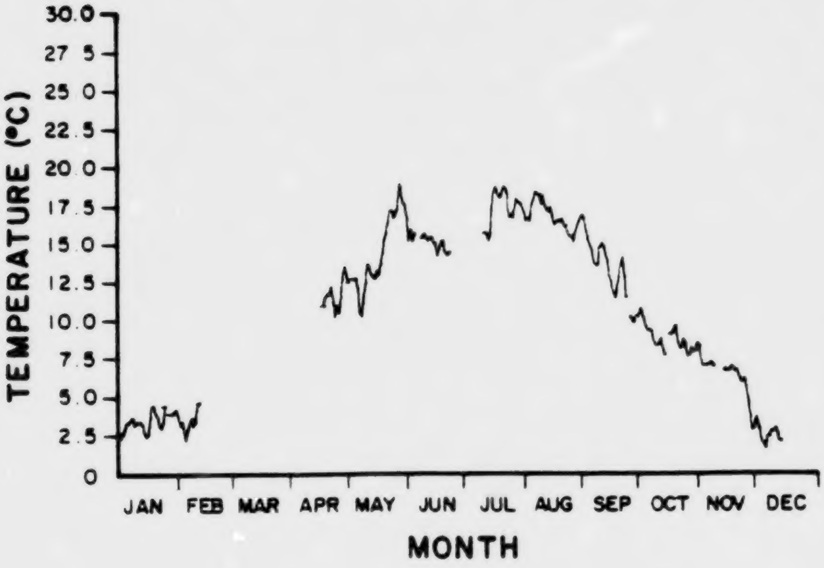
Quinsam River 1981



Quinsam River 1982



Quinsam River 1983



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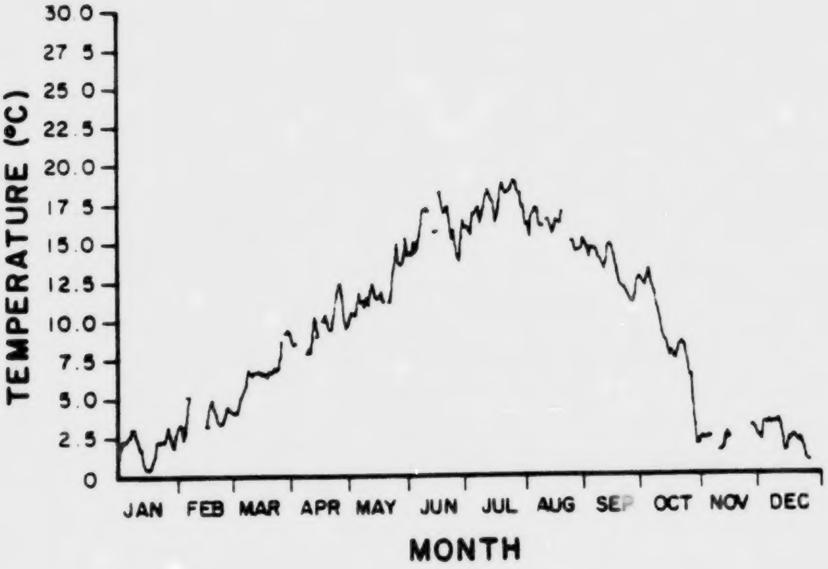
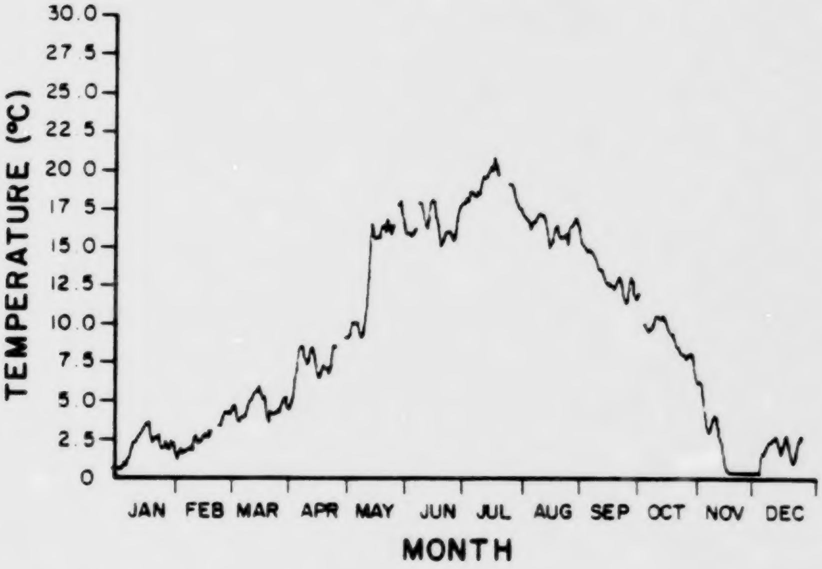
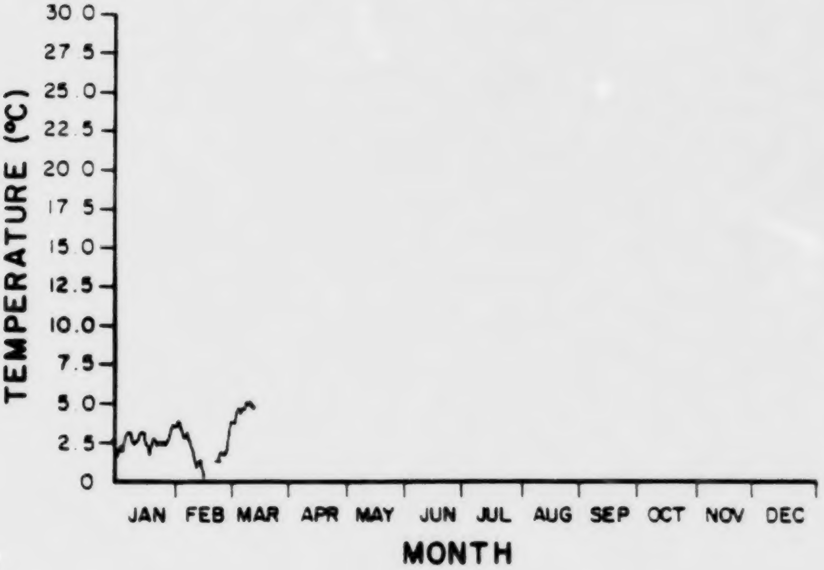


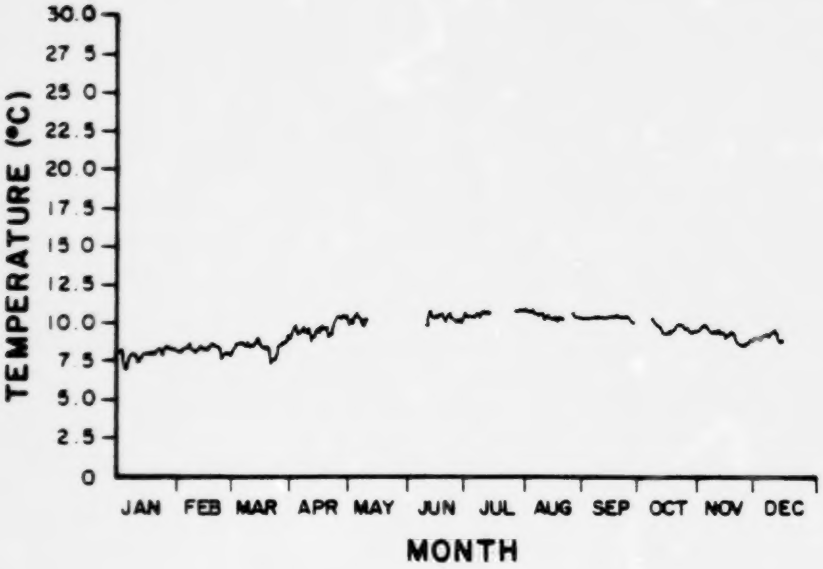
Quinsam River 1985



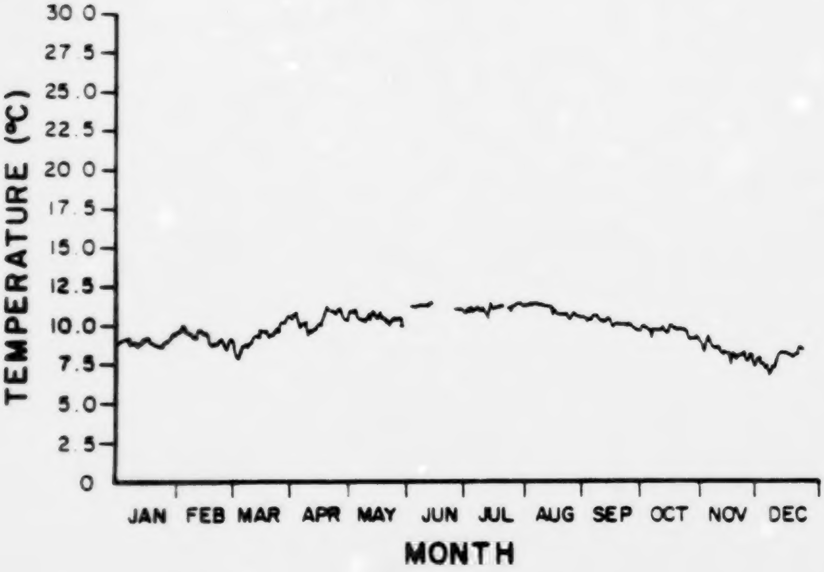
Quinsam River 1986



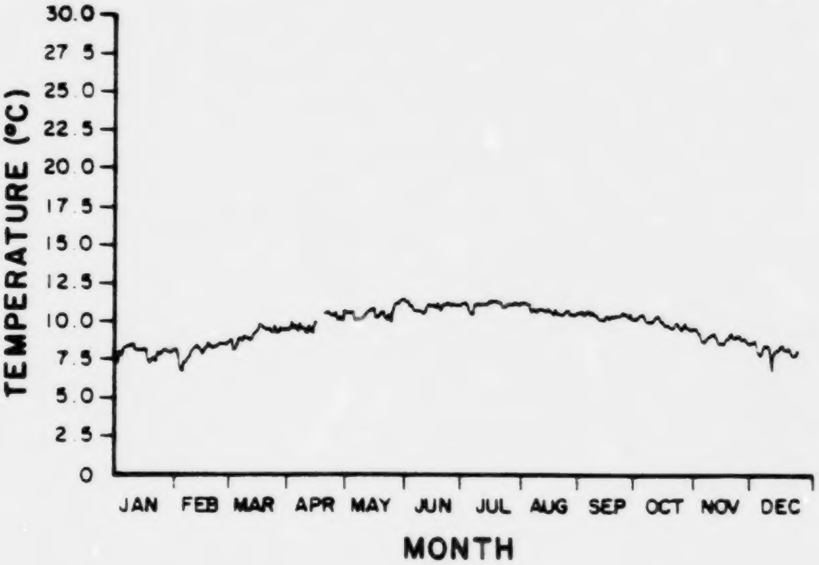
Cold Creek 1976



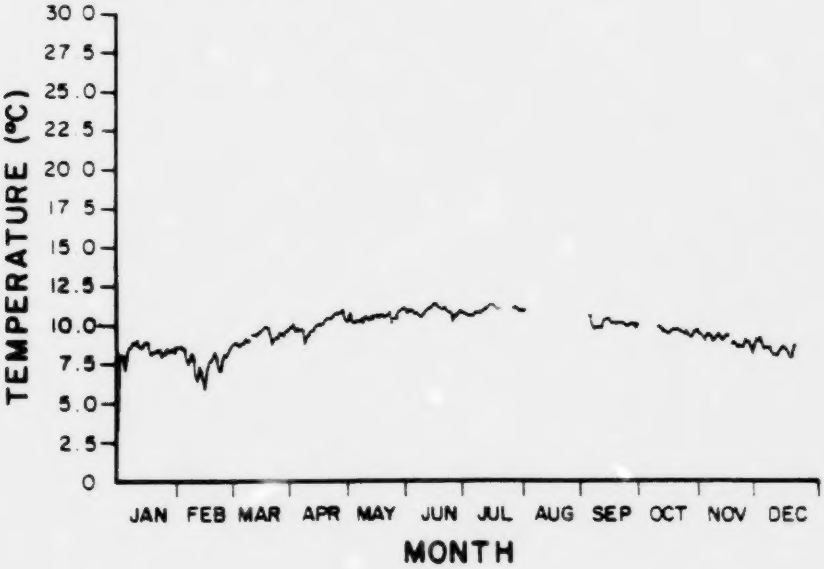
Cold Creek 1977

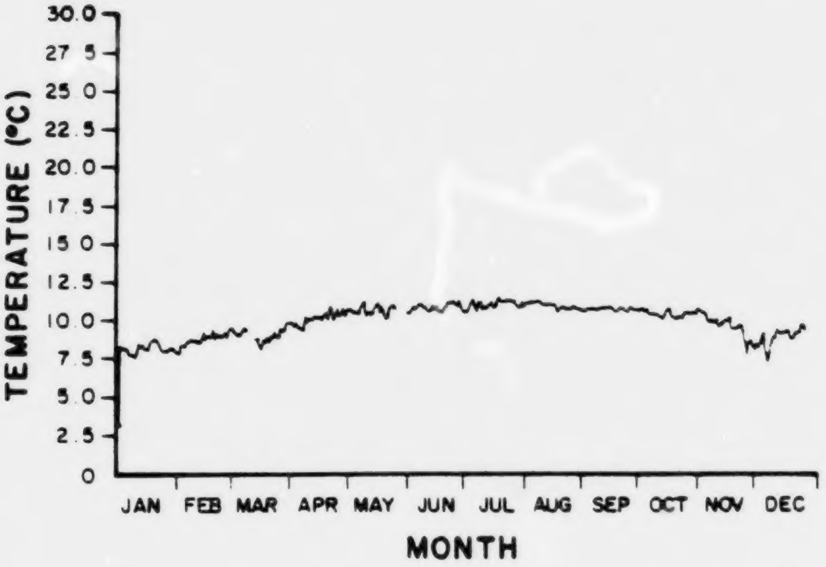


Cold Creek 1978

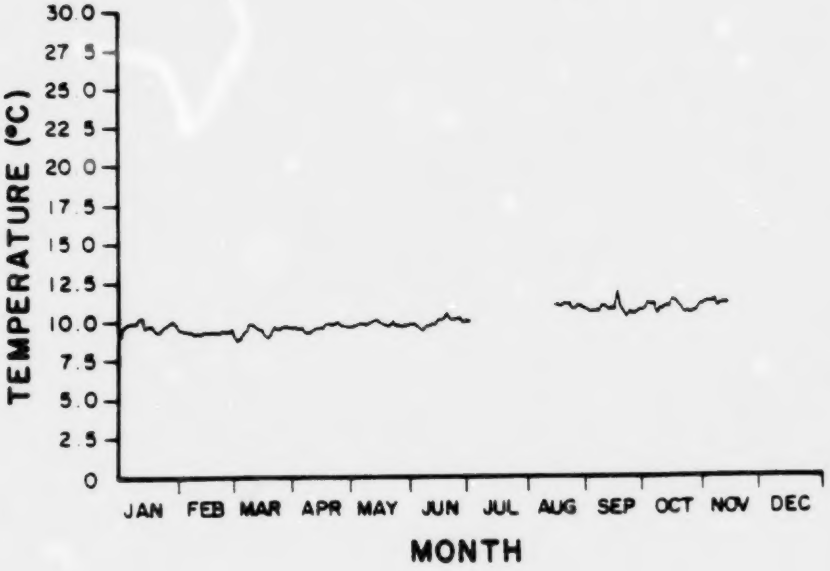


Cold Creek 1979

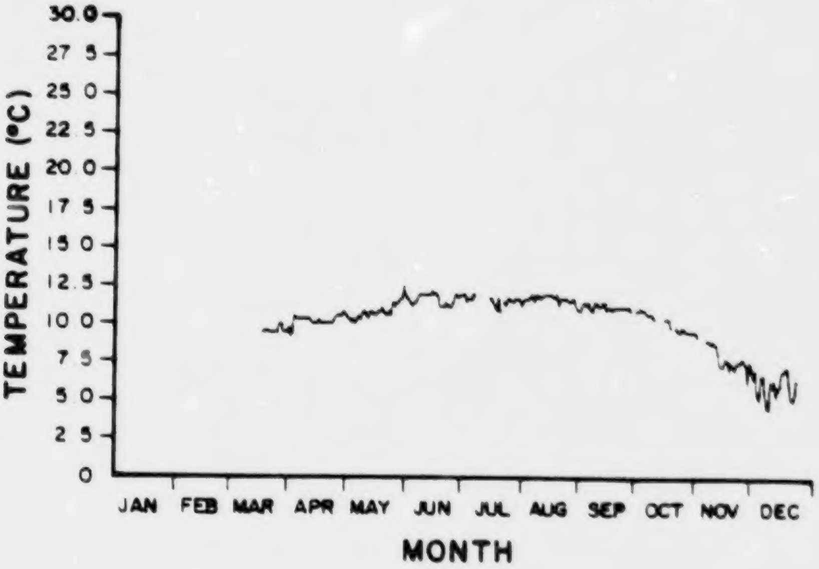


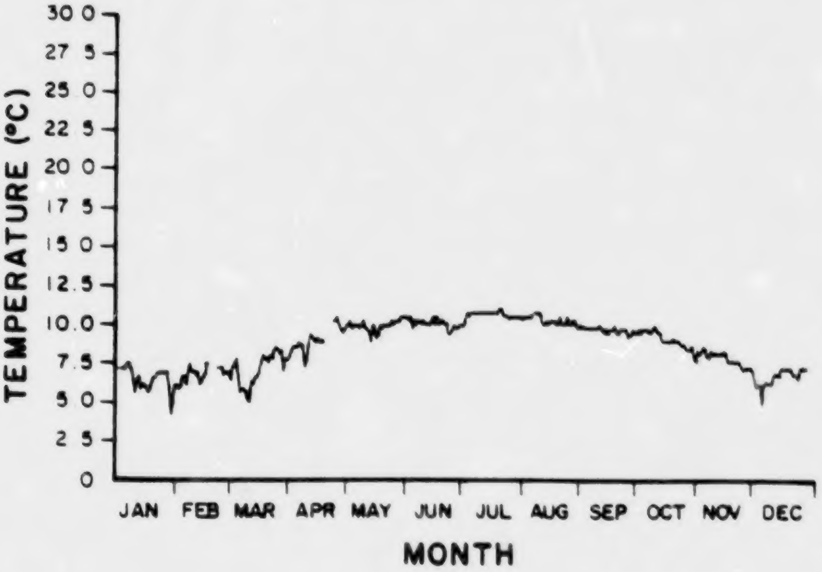


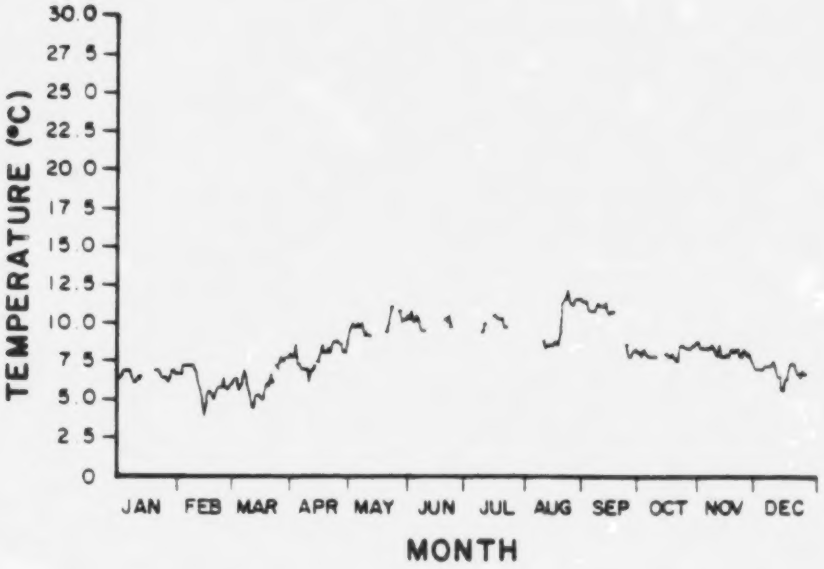
Cold Creek 1980



Cold Creek 1981


Cold Creek 1970


Cold Creek 1971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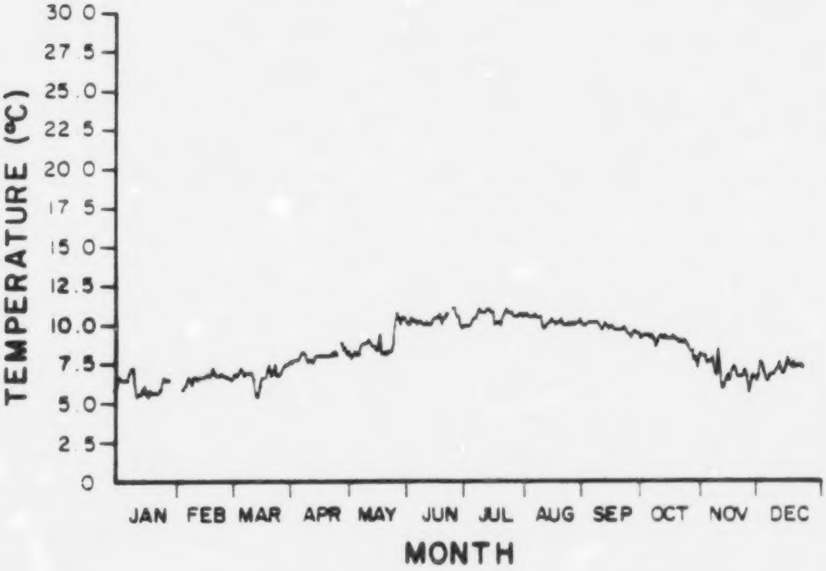
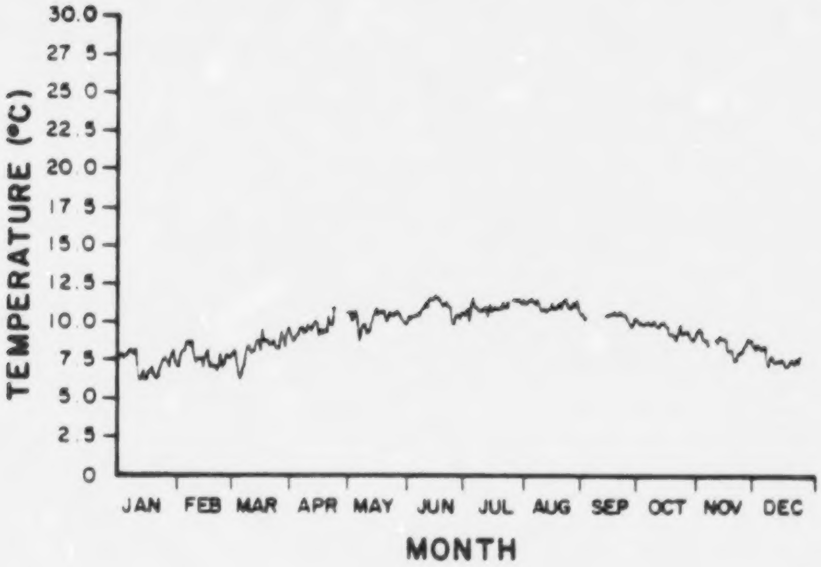
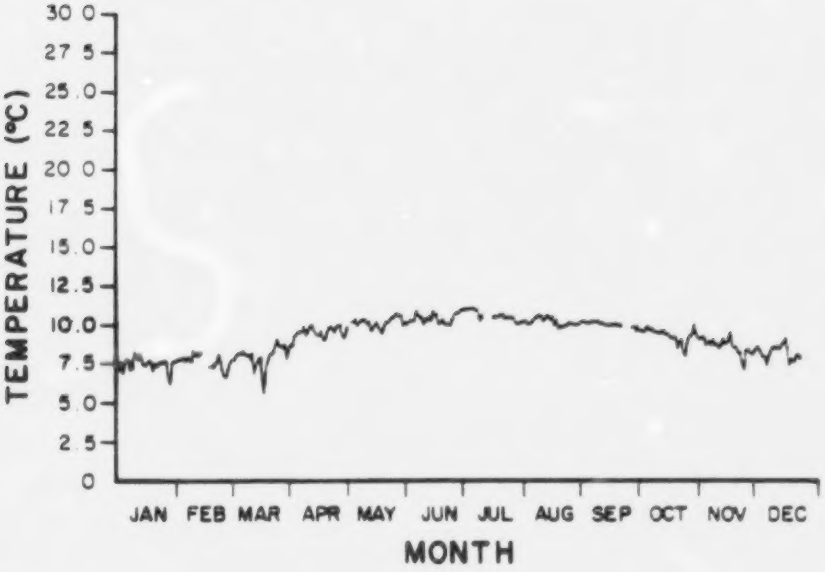
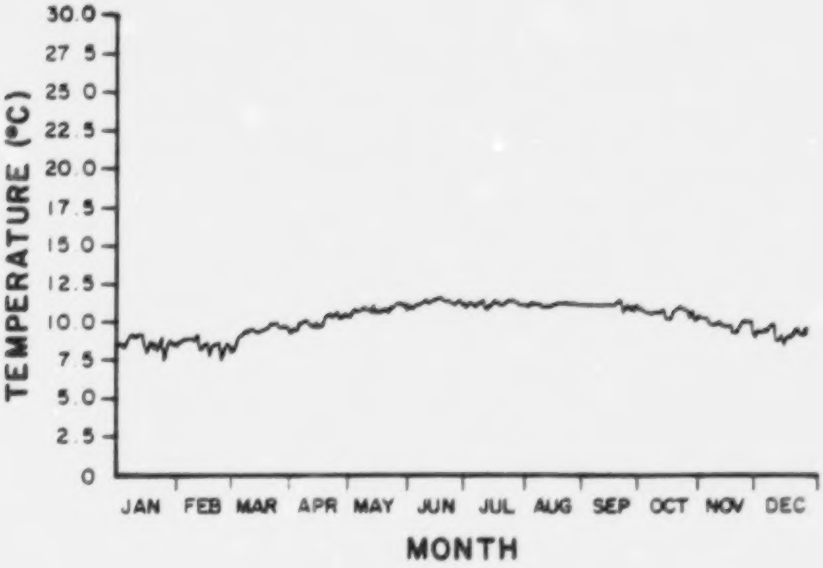

Cold Creek 1973

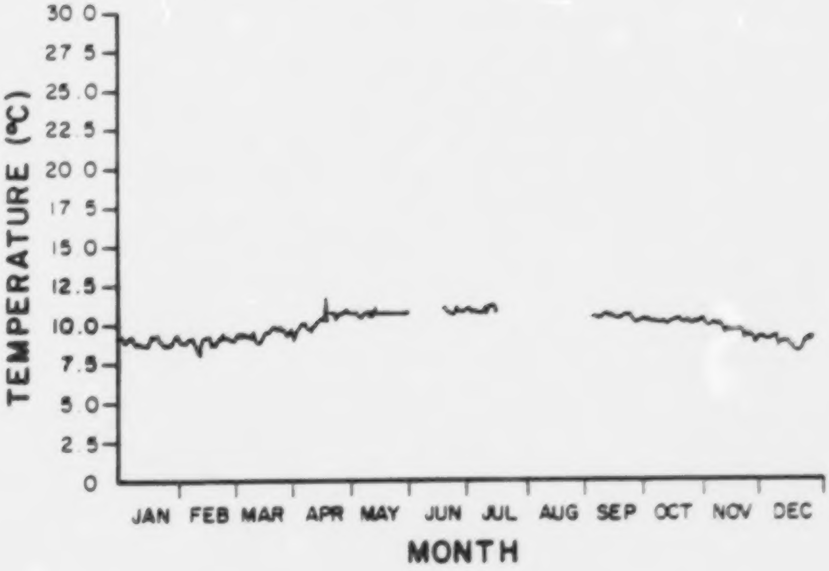
Cold Creek 1974



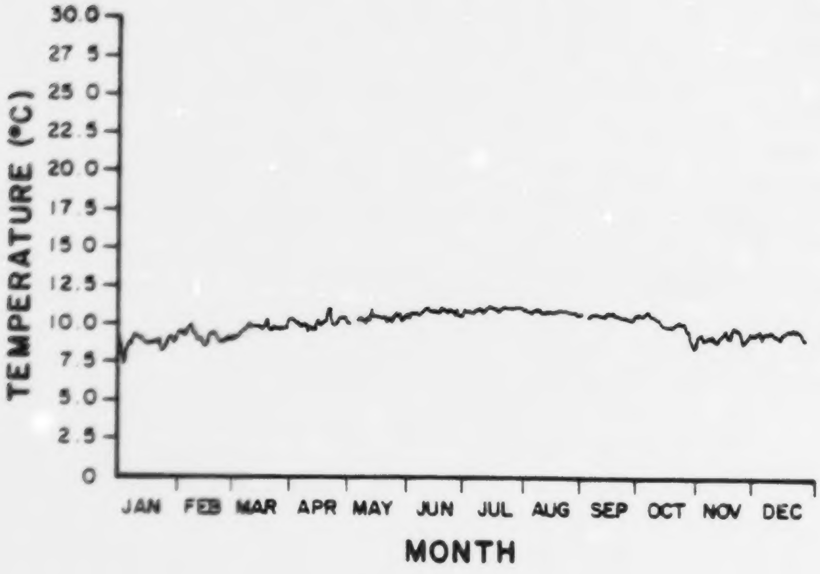
Cold Creek 1975



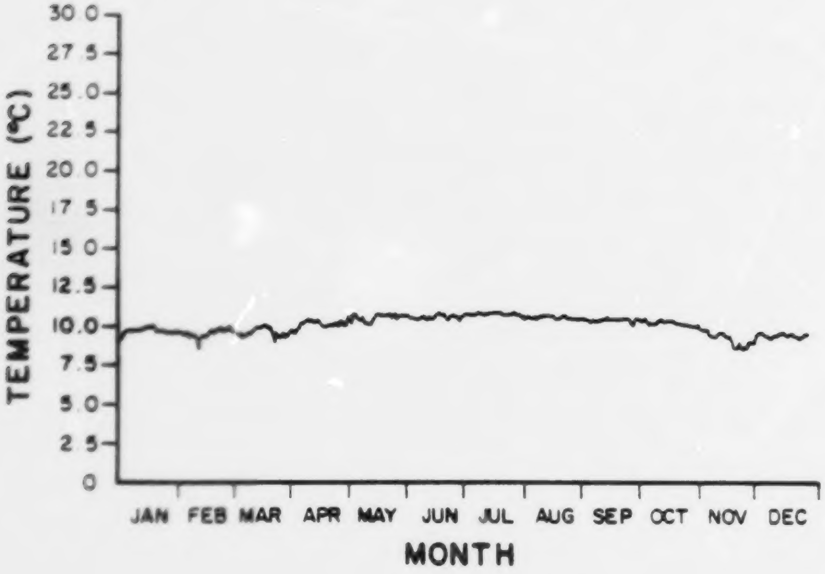

Cold Creek 1982


Cold Creek 1983

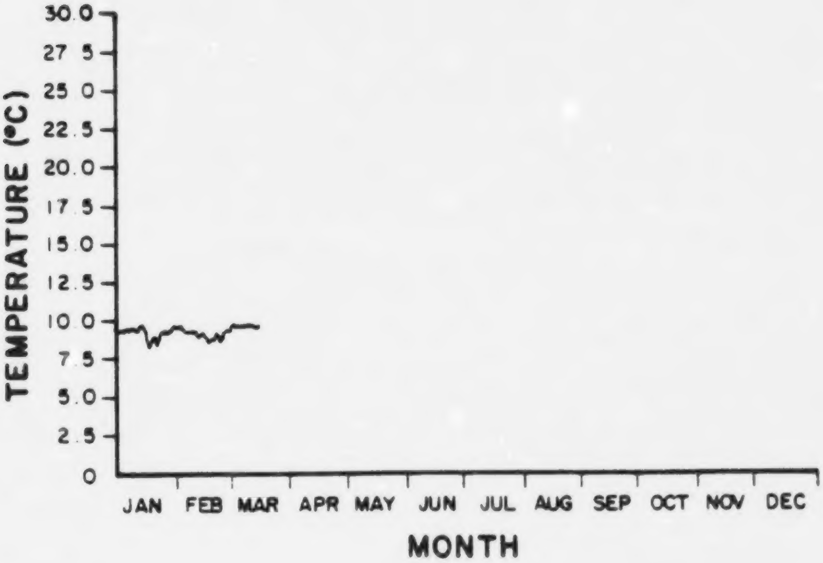
Cold Creek 1984



Cold Creek 1985



Cold Creek 1986



Facility: ROBERTSON

Location:

Located near the outlet of Great Central Lake, approximately 15 km northwest of Port Alberni, off on the west coast of Vancouver Island.

Description:

First operated as a spawning channel for the introduciton of pink salmon in 1959, the hatchery was built to enhance Roberston Creek chinook and steelhead stocks in 1972, and was enlarged and expanded up to 1981. Expansions were done to increase chinook and coho production and to mitigate steelhead losses in the expanded terminal fishery.

Egg production targets in 1985 were 1.5 M coho, 10.1 M chinook, and 370 K steelhead. Eggs are obtained from the Stamp River and the Nahmint River. Juveniles are released into the Robertson Creek, Somass River, Stamp Lagoon, Ash River, Nahmint River and Elsie Lake.

Water Sources:

Surface. An intake at __ m in Great Central Lake supplies the pumped water for incubation, as well as some of the water for the rest of the hatchery (a total of 3,637 lpm). Robertson Creek serves as a gravity-feed supply (254,852 lpm) to various channels.

Groundwater. Three domestic wells (total of 364 lpm) are available to the hatchery. This water has not yet been used.

General Water Quality:

Total gas pressure and NFR levels are periodically high, temperatures are high in the summer months. There is potential for pollution from float camps and a sawmill on Great Central Lake. Temperatures are controlled by mixing water from the hypolimnion in Great Central Lake with Robertson Creek water.

Special Notes:

As the well water is not used by the hatchery, no water temperature records have been kept.

WATER QUALITY VALUES FOR ROBERTSON CREEK
(below detection limits = 0)

PARAMETERS	DEC21/79 WELL # 3	APR06/80 WELL # 3	APR06/80 WELL # 3	APR06/80 WELL # 3	MAY06/80 WELL # 3	MAY06/80 WELL # 3	MAY06/80 WELL # 3	MAY26/80 WELL # 3	DEC21/80 WELL # 3	MAY20/82 WELL # 3	MAY20/82 WELL # 3
Alkalinity	22.7	13.5	13		17.6	13		13.5	22.7		
Ammonia	0	0	0		0	.01		0	0		
CO2											
Chloride	4.5	1.3	1.4		1	.8		1	4.5		
Color											
Conductivity Field											
Conductivity Lab	62	31.5	32.6		0	32.3		32.9	62		
Dissolved O2-ppm											
Dissolved O2-%sat									35.5		
Dissolved Gas Tot									97		
Dissolved Nitrogen									112.69		
Hardness	27.6	14.2	13.7	14	17.7	14.5	14.1	14	27.6	13.9	14
Nitrite	0	0	.005		0	0		0	0		
Nitrate	.085	.02	.02		0	.016		.02	.085		
pH-Field		7.5	7.4		7.3	7.2		7.3	6.7		
pH-Lab	6.7										
Phosphate	0	0	0		0	0		.005	0		
Residue Filterable	52	24	30		31	29		22	52		
Residue Non-Filter	0	0	0		0	0		0	0		
Silica	5.75	1	.7		2.25	1		0	5.75	.9	.9
Sulphate	1	1.8	1.9		1.3	1.3		2.6	1		
Taste											
Temperature									11.5		
Turbidity	0										
METALS--											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0										
Ba-Barium	0										
Ca-Calcium	8.44	5	4.8	4.8	5.94	5	4.9	5	8.44	4.9	4.9
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0										
Cr-Chromium	0										
Cu-Copper	0	0	0	0	0	0	0	.001	0	.006	.005
Fe-Iron	0	.01	.16	.013	.0286	.022	.023	.035	0	.027	.022
Hg-Mercury	0	0	0	0	0	0	0	0	.00025	0	0
K—Potassium	.092	.05	.05	.05	.066	.05	.05	.05	.092	.07	.06
Mg-Magnesium	1.59	.4	.4	.4	.7	.4	.4	.4	1.59	.4	.4
Mn-Manganese	.048	.002	.002	.003	.117	.005	.003	.019	.0048	.004	.004
Mo-Molybdenum	0										
Na-Sodium	2.14										
Ni-Nickle	0										
P—Phosphorus	0										
Pb-Lead	0	0	0	0	0	0	0	0	0	0	0
Sb-Antimony	0										
Se-Selenium	0										
Si-Silicon	5.89										
Sn-Tin	0										
Sr-Strontium	.0231										
Ti-Titanium	0										
V—Vanadium	0										
Zn-Zinc	.001	0	.018	.061	.0027	.008	.012	.005	.001	.009	.004

WATER QUALITY VALUES FOR ROERTSON CREEK

(below detection limits = 0)

PARAMETERS	MAY28/82 WELL # 3	JUN12/78 INCU-BATION	MAY24/79 INCU-BATION	MAY28/79 INCU-BATION	APR02/80 INCU-BATION	MAY26/82 INCU-BATION
Alkalinity	14	13.8	16.7	16.7	14.5	13.5
Ammonia	.165	.0065	.0526	0	0	.02
CO2						
Chloride	1.1	1.05	2.55	2.55	.92	1
Color						
Conductivity Field						
Conductivity Lab	34.7	32.4	0	43	33.6	0
Dissolved O2-ppm						
Dissolved O2-%sat						
Dissolved Gas Tot					106.5	
Dissolved Nitrogen						
Hardness	14.1	15.6	19.5	19.5	14.6	14
Nitrite	0	0		0	0	
Nitrate	0	0	0	.0526	.0145	0
pH-Field	7.1	7.3	6.8		7.1	7.3
pH-Lab				6.8		
Phosphate	.031	0	0	0	0	.005
Residue Filterable	24	24	35	35	25	22
Residue Non-Filter	0	0	0	0	0	0
Silica	0	.8	2.92	2.92	1.02	0
Sulphate	2.4	1.2	0		1.1	2.6
Taste						
Temperature					9.1	
Turbidity				0		
METALS—						
Al-Aluminum	0	0	0	0	0	0
As-Arsenic				0	0	
Ba-Barium				0	0	
Ca-Calcium	4.9	5.52	6.48	6.48	5.15	5
Cd-Cadmium	0	0	0	0	0	0
Co-Cobalt				0	0	
Cr-Chromium				0	0	
Cu-Copper	0	0	.0029	.0029	0	.001
Fe-Iron	.041	.042	.035	.035	.024	.035
Hg-Mercury	0	0	0	0	0	0
K—Potassium	.06	NA	.075	.075	.038	.05
Mg-Magnesium	.4	.43	.795	.795	.418	.4
Mn-Manganese	.02	.0113	.0052	.0052	.0032	.019
Mo-Molybdenum				0	0	
Na-Sodium		.02	1.21	1.21	.608	.7
Ni-Nickle				0	0	
P—Phosphorus				0	0	
Pb-Lead	0	0	0	0	0	0
Sb-Antimony				0	0	
Se-Selenium				0	0	
Si-Silicon				2.88	.95	
Sn-Tin				0	0	
Sr-Strontium				.0143	.0074	
Ti-Titanium				0	0	
V—Vanadium				0	0	
Zn-Zinc	.005	0	.0039	0	0	.005

ROBERTSON CREEK 1971

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.78	4.44	3.65	31
FEBRUARY	3.06	4.44	4	28
MARCH	2.78	5.28	4.3	31
APRIL	5	9.72	6.84	30
MAY	9.17	14.17	11.91	31
JUNE	10.83	15.28	13.74	30
JULY	13.33	21.11	17.09	31
AUGUST	16.11	21.67	18.74	31
SEPTEMBER	14.17	18.33	16.27	30
OCTOBER	8.89	15.56	12.77	31
NOVEMBER	6.67	9.44	7.86	30
DECEMBER	3.33	6.67	4.56	31

ROBERTSON CREEK 1972

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	1.94	16.39	3.41	31
FEBRUARY	1.94	3.33	2.68	28
MARCH	2.78	6.39	4.17	31
APRIL	5.28	8.61	6.7	30
MAY	8.33	16.11	11.49	31
JUNE	14.44	17.5	15.84	30
JULY	15.56	20.56	18.06	31
AUGUST	18.06	22.78	19.78	31
SEPTEMBER	12.78	21.11	16.7	30
OCTOBER	10.56	13.89	12.2	31
NOVEMBER	6.67	11.11	8.46	30
DECEMBER	2.5	7.22	4.19	31

ROBERTSON CREEK 1973

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	1.11	3.89	2.5	31
FEBRUARY	1.39	5	3.18	28
MARCH	3.89	7.22	5.24	31
APRIL	6.67	12.78	9.41	30
MAY	11.11	16.94	13.54	31
JUNE	13.33	18.61	15.5	30
JULY	15.56	21.39	18.6	31
AUGUST	17.78	21.67	19.53	31
SEPTEMBER	16.11	19.72	17.96	30
OCTOBER	10.56	16.94	13.4	31
NOVEMBER	4.72	10.56	7.19	30
DECEMBER	4.17	5.28	4.77	31

ROBERTSON CREEK 1974

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.5	4.17	3.63	31
FEBRUARY	2.5	4.17	3.15	28
MARCH	2.78	6.11	4.23	31
APRIL	5.56	10	7.43	30
MAY	9.72	13.89	11.25	31
JUNE	12.78	19.44	16.26	30
JULY	15.56	21.11	17.55	31
AUGUST	15	22.78	18.8	31
SEPTEMBER	17.22	21.67	19.14	30
OCTOBER	11.39	17.78	14.5	31
NOVEMBER	6.39	11.39	8.95	30
DECEMBER	3.61	7.22	5.51	31

ROBERTSON CREEK 1975

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.22	3.61	3.1	31
FEBRUARY	1.94	3.33	2.72	28
MARCH	2.5	10	5.16	31
APRIL	6.67	13.33	10.12	30
MAY	11.39	16.67	13.6	31
JUNE	13.61	18.89	16.33	30
JULY	16.39	21.94	19.22	31
AUGUST	16.39	21.11	18.63	31
SEPTEMBER	16.11	20	17.65	30
OCTOBER	8.61	17.78	12.37	31
NOVEMBER	4.44	10	7.23	30
DECEMBER	3.33	5.56	4.34	31

ROBERTSON CREEK 1976

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.78	4.44	3.59	31
FEBRUARY	2.78	4.17	3.69	28
MARCH	3.06	6.11	4.39	31
APRIL	4.17	12.22	7.79	30
MAY	10	14.44	12.53	31
JUNE	11.11	18.89	15.31	30
JULY	15.83	20.56	17.73	31
AUGUST	16.67	18.89	17.75	31
SEPTEMBER	16.39	19.44	17.6	30
OCTOBER	12.22	18.33	14.53	31
NOVEMBER	7.22	11.94	10.37	30
DECEMBER	5.83	8.33	7.14	31

ROBERTSON CREEK 1977

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	4.17	5.83	5.03	31
FEBRUARY	4.72	7.22	5.91	28
MARCH	4.44	8.89	6.13	31
APRIL	4.44	14.17	10.02	30
MAY	12.22	15.83	13.45	31
JUNE	13.33	20.28	17.1	30
JULY	17.78	22.5	19.81	31
AUGUST	18.33	24.17	21.72	31
SEPTEMBER	15.56	20.56	18.05	30
OCTOBER	10.83	19.17	13.56	31
NOVEMBER	4.17	10.28	7.17	30
DECEMBER	3.33	5.56	4.2	31

ROBERTSON CREEK 1978

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.5	4.4	3.83	31
FEBRUARY	3.6	6.1	4.64	28
MARCH	4.4	8.8	6.61	31
APRIL	6.8	12.8	9.76	30
MAY	11.1	17.2	14.01	31
JUNE	10.3	22.2	18.62	30
JULY	18.3	25.2	21.12	31
AUGUST	18.2	24.4	21.22	31
SEPTEMBER	15	18.9	16.97	30
OCTOBER	11.7	16.7	14.47	31
NOVEMBER	6.1	12.7	8.72	30
DECEMBER	2.8	7.2	4.92	31

ROBERTSON CREEK 1979

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.4	4.2	3.58	31
FEBRUARY	2.2	4.2	3.45	28
MARCH	3.3	8.9	5.81	31
APRIL	7.5	15.6	11.18	30
MAY	12.5	18.3	14.76	31
JUNE	16.4	20.8	18.36	30
JULY	16.1	23.9	19.57	31
AUGUST	20.3	22.8	21.52	31
SEPTEMBER	16.7	20.6	21.52	30
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

ROBERTSON CREEK 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.7	5.4	3.69	31
FEBRUARY	2.1	4.5	3.64	28
MARCH	4.1	8.4	5.77	31
APRIL	7.3	13.4	9.45	30
MAY	12.1	17.7	14.64	31
JUNE	13	18.2	15.14	30
JULY	13.8	19.4	16.06	31
AUGUST	13.4	18.2	15.59	31
SEPTEMBER	12.8	15.9	14.21	30
OCTOBER	12.3	15.9	14	31
NOVEMBER	7.6	12.8	9.85	30
DECEMBER	4.9	7.5	6.27	31

ROBERTSON CREEK 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	5.3	7.2	6.14	31
FEBRUARY	4.1	7.4	5.51	28
MARCH	5.4	9.5	7.82	31
APRIL	7.8	12.5	10.11	30
MAY	10.7	15.5	12.35	31
JUNE	13.5	18.7	15.14	30
JULY	14.5	20.5	17.96	31
AUGUST	15.3	20.1	17.58	31
SEPTEMBER	13	17.7	15.48	30
OCTOBER	10.7	14.1	12.63	31
NOVEMBER	7	11.8	9.34	30
DECEMBER	4.1	7.6	5.31	31

ROBERTSON CREEK 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.5	4.9	3.97	31
FEBRUARY	3.4	5.1	4.14	28
MARCH	3.5	8.1	5.84	31
APRIL	5.5	11.5	8.21	30
MAY	9.5	18.5	13.63	31
JUNE	13	18.7	15.84	30
JULY	12	17.9	14.48	29
AUGUST	13.1	18.1	15.78	31
SEPTEMBER	14.5	17.7	15.81	17
OCTOBER	11	16.4	13.72	28
NOVEMBER	5.2	10.1	7.28	27
DECEMBER	5.2	6.5	5.71	15

ROBERTSON CREEK 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL	6	15.1	10.48	30
MAY	12.9	17.9	14.96	31
JUNE	13.6	18.4	15.66	30
JULY	15.5	19.5	17.07	31
AUGUST	13.9	17.8	15.79	31
SEPTEMBER	12.9	19.2	15.41	30
OCTOBER	11.9	14.5	13.35	31
NOVEMBER	6	11.5	8.57	30
DECEMBER	2.3	5.75	4.07	31

ROBERTSON CREEK 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3	4.25	3.69	31
FEBRUARY	3.5	4.9	4.2	28
MARCH	4.1	8.4	6.29	31
APRIL	6.6	12.1	8.55	30
MAY	9.8	15.9	12.31	31
JUNE	13.8	19	15.88	30
JULY	12.2	18.3	15.09	31
AUGUST	12.1	15.6	13.38	31
SEPTEMBER	10.1	14.2	12.36	30
OCTOBER	7.8	14.1	11.34	31
NOVEMBER	5.4	8.1	6.91	30
DECEMBER	3	5.5	4.25	31

ROBERTSON CREEK 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	2.7	5.1	3.99	31
FEBRUARY	3	5.3	4.04	28
MARCH	4	7.1	5.47	31
APRIL	6.2	10.9	8.96	30
MAY	5.2	17.2	12.6	31
JUNE	12.2	19.1	15.86	30
JULY	13.1	17.6	15.21	31
AUGUST	12.8	15.8	14.11	31
SEPTEMBER	11.6	15.8	13.7	30
OCTOBER	9.8	15.2	12.95	31
NOVEMBER	2.3	10.7	6.83	30
DECEMBER	2	4.6	3.76	31

ROBERTSON CREEK 1986

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	3.4	4.8	4.01	31
FEBRUARY	2.6	5.5	3.89	28
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

GREAT CENTRAL LAKE 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE	4.44	11.11	6.39	9
JULY	5	14.44	7.39	31
AUGUST	5.56	11.67	6.72	26
SEPTEMBER	5.56	10.56	7.19	17
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

GREAT CENTRAL LAKE 1982

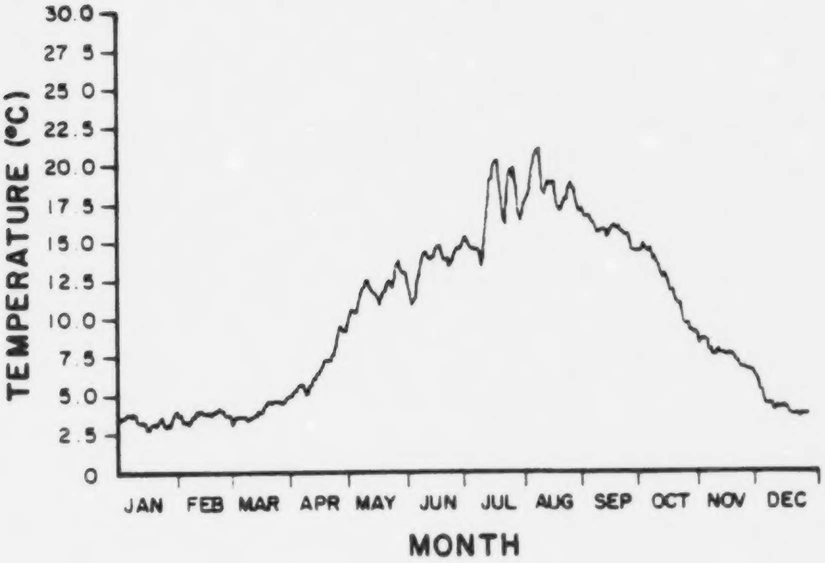
MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY	1.11	13.89	4.78	31
AUGUST	1.67	10.56	3.77	24
SEPTEMBER	1.67	15.56	4.41	30
OCTOBER	7.78	16.67	10.29	28
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

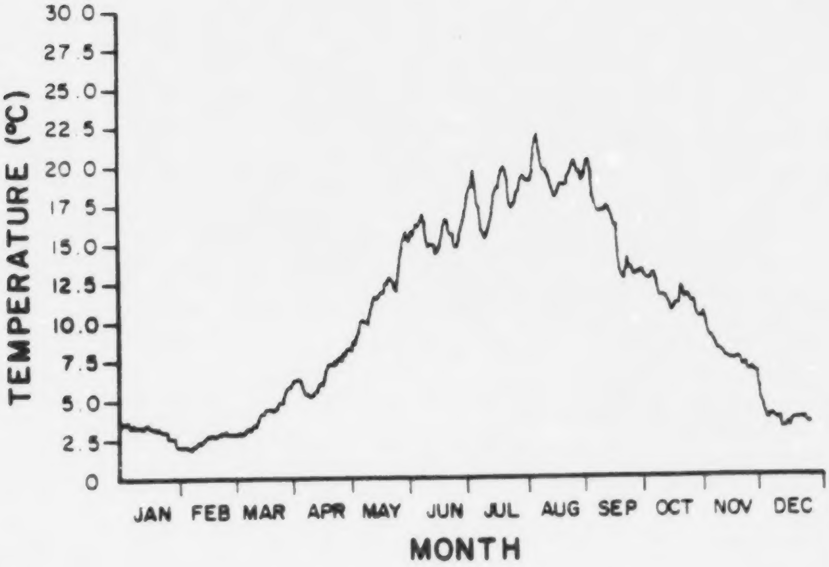
GREAT CENTRAL LAKE 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY	2.22	8.33	4.41	8
JUNE	2.22	10.56	3.68	27
JULY	1.67	9.44	3.12	30
AUGUST	1.11	14.44	3.18	30
SEPTEMBER	2.22	8.89	3.96	24
OCTOBER	2.78	6.11	3.69	11
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

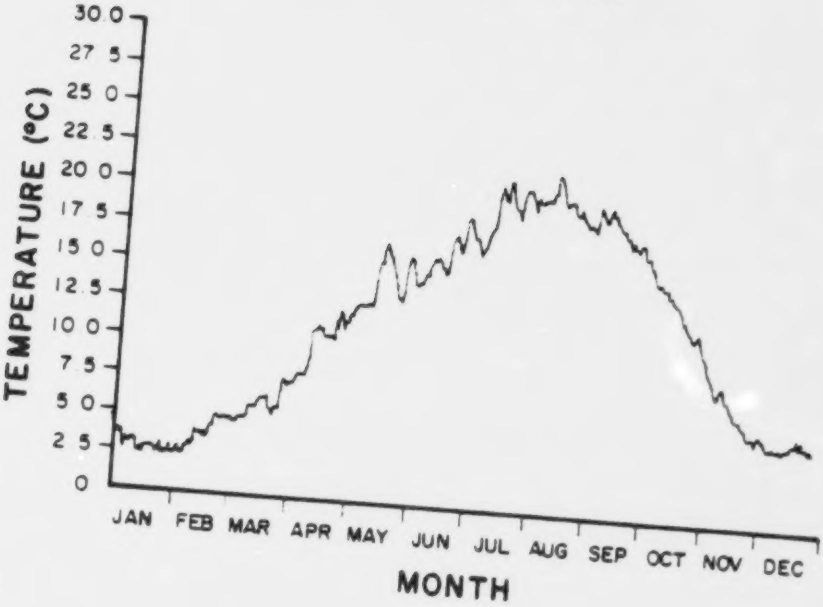
GREAT CENTRAL LAKE 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY	2.22	14.44	6.69	26
AUGUST	1.67	10.56	4.27	8
SEPTEMBER	1.67	17.78	8.6	23
OCTOBER	11.67	28.89	14.86	8
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

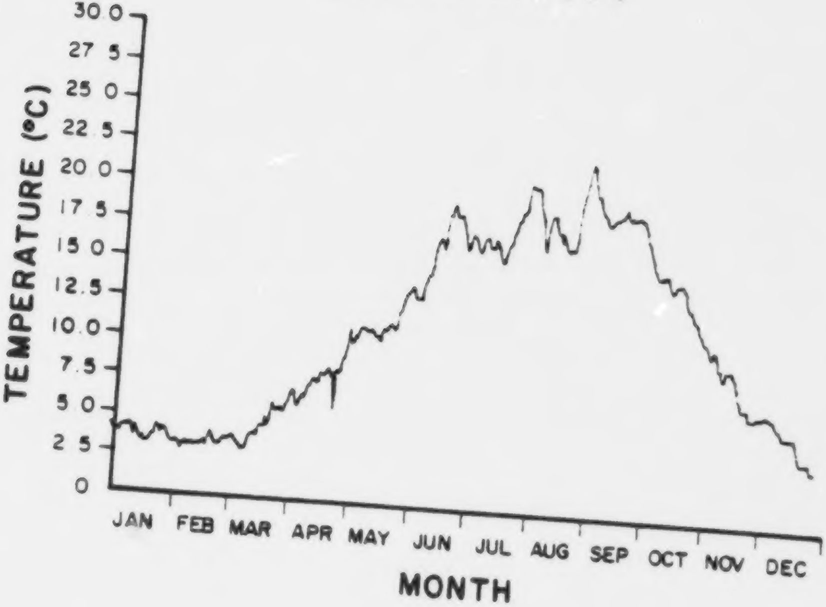

Robertson Creek 1971


Robertson Creek 1972

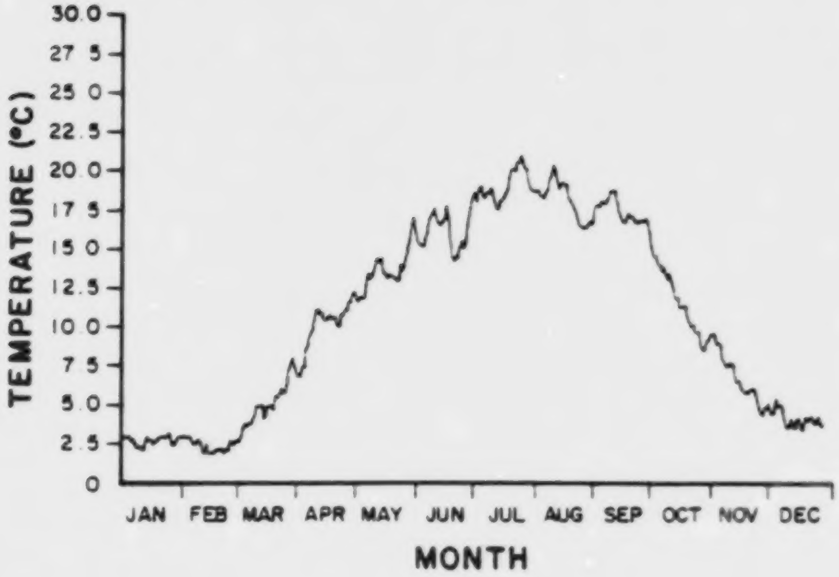
Robertson Creek 1973



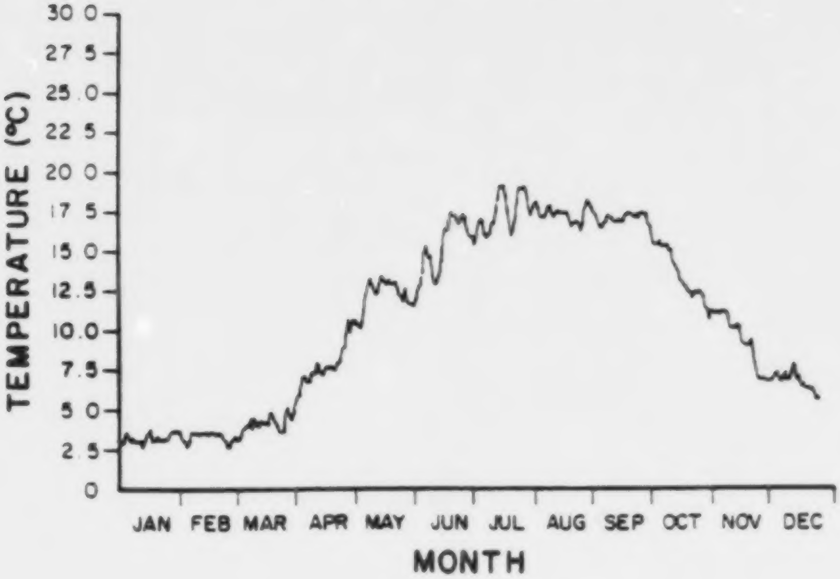
Robertson Creek 1974

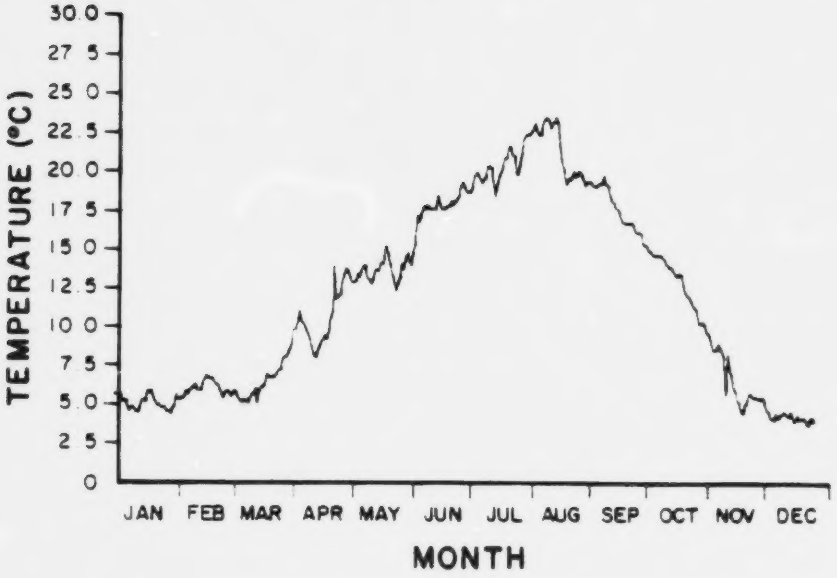


Robertson Creek 1975

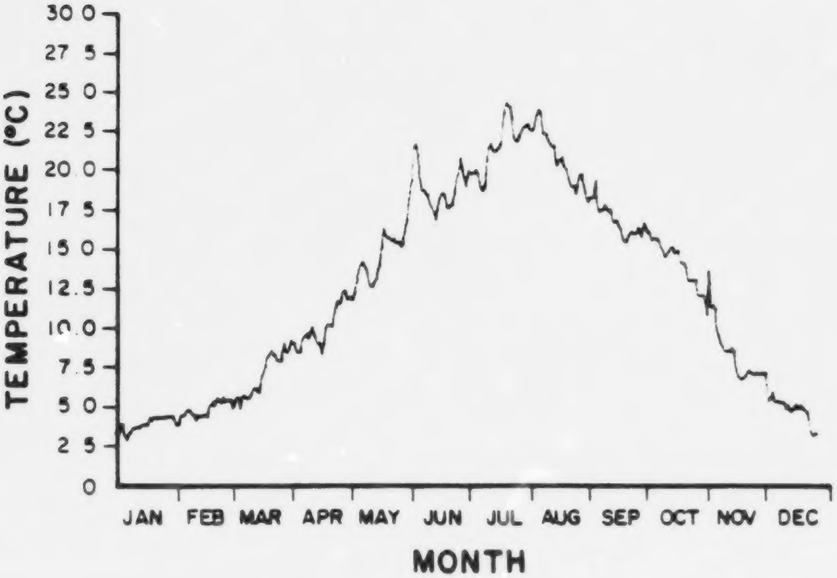


Robertson Creek 1976



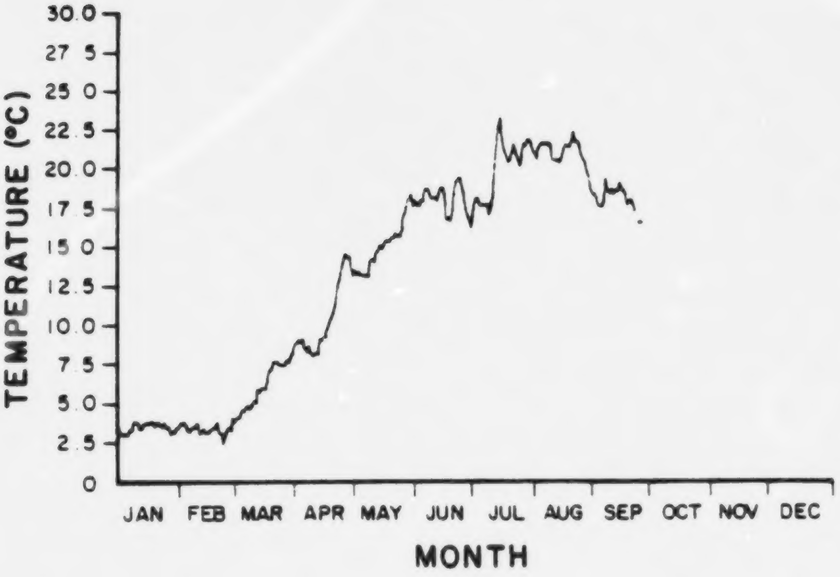


Robertson Creek 1977

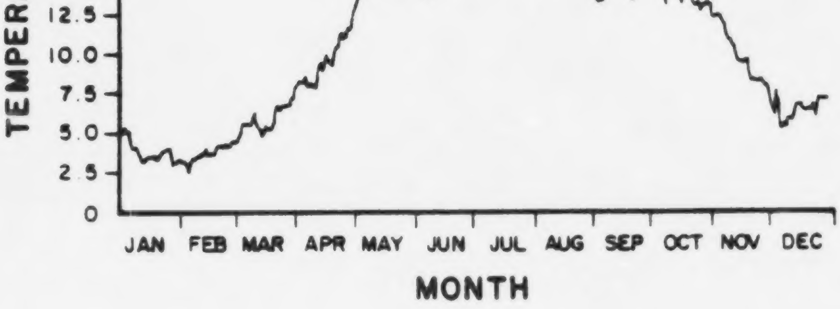


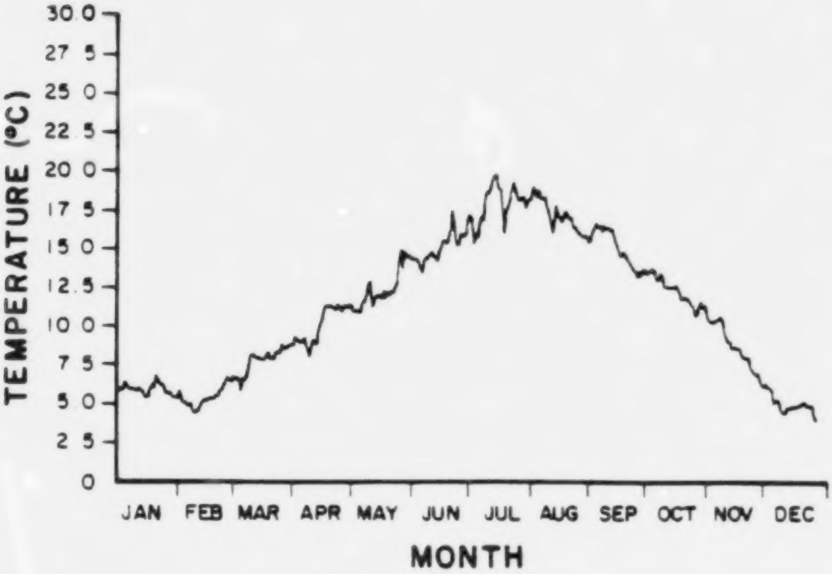
Robertson Creek 1978

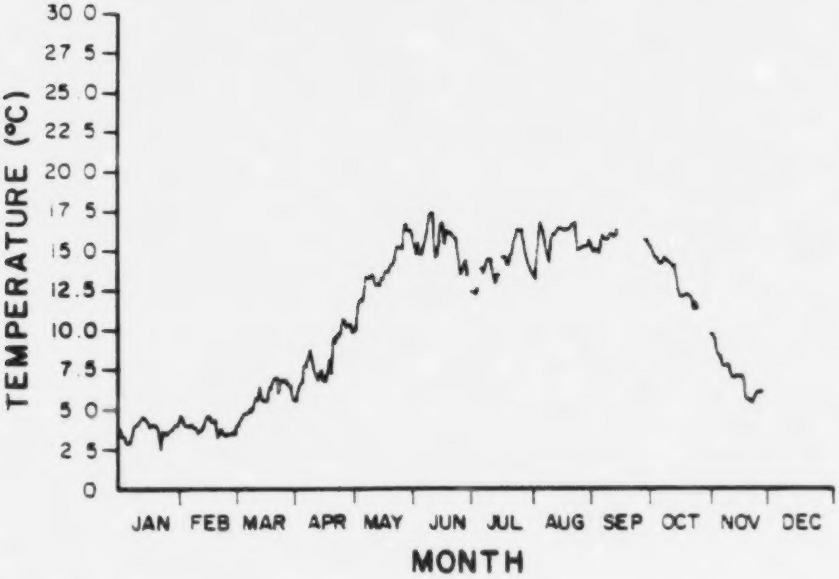
Robertson Creek 1979

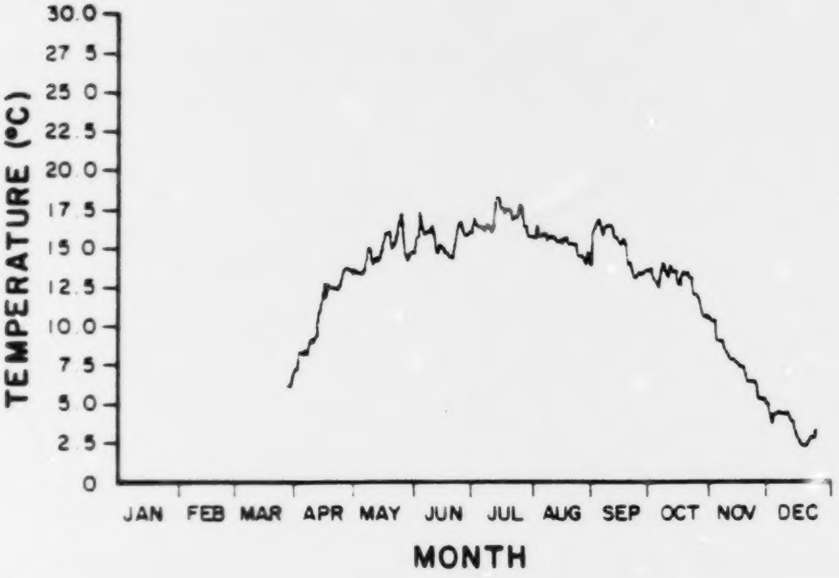


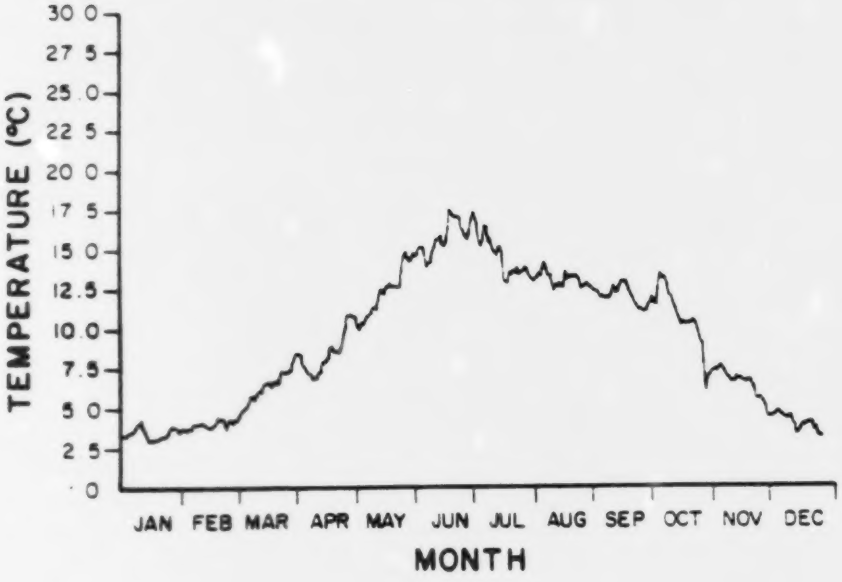
Robertson Creek 1980



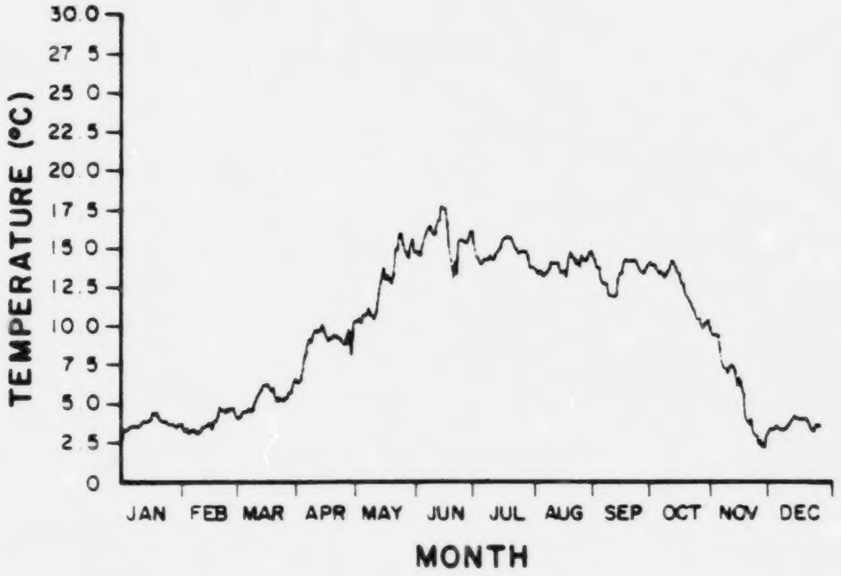

Robertson Creek 1981


Robertson Creek 1982

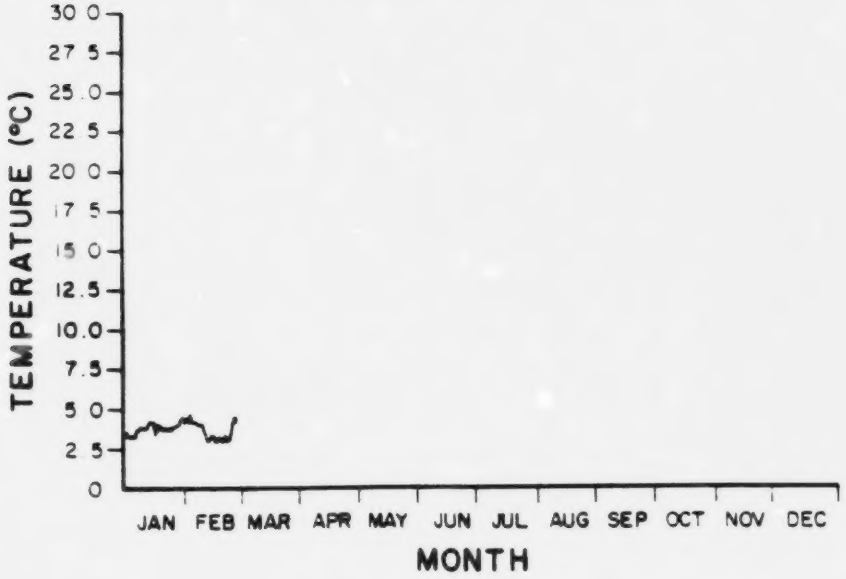

Robertson Creek 1983


Robertson Creek 1984

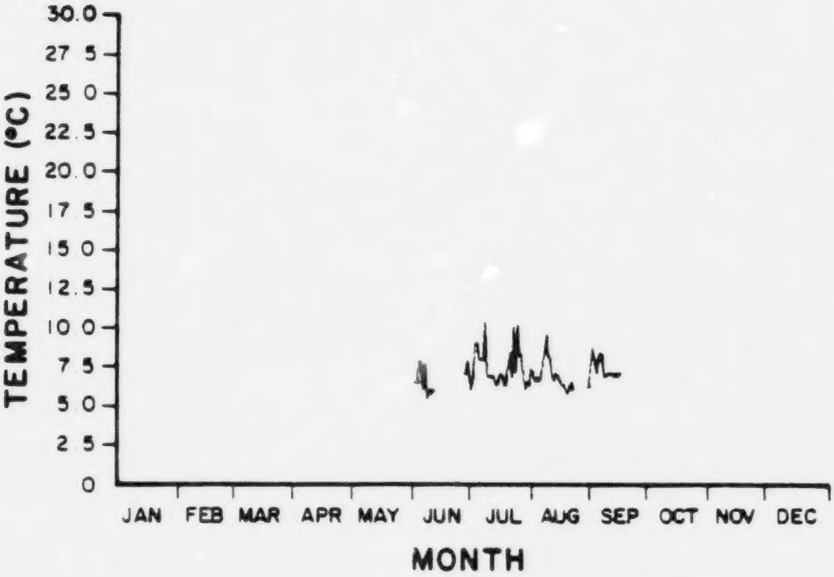
Robertson Creek 1985



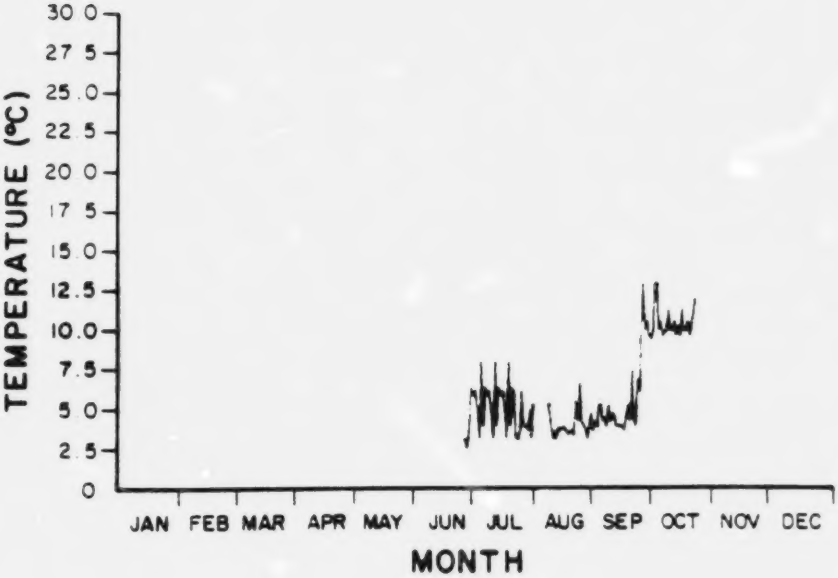
Robertson Creek 1986



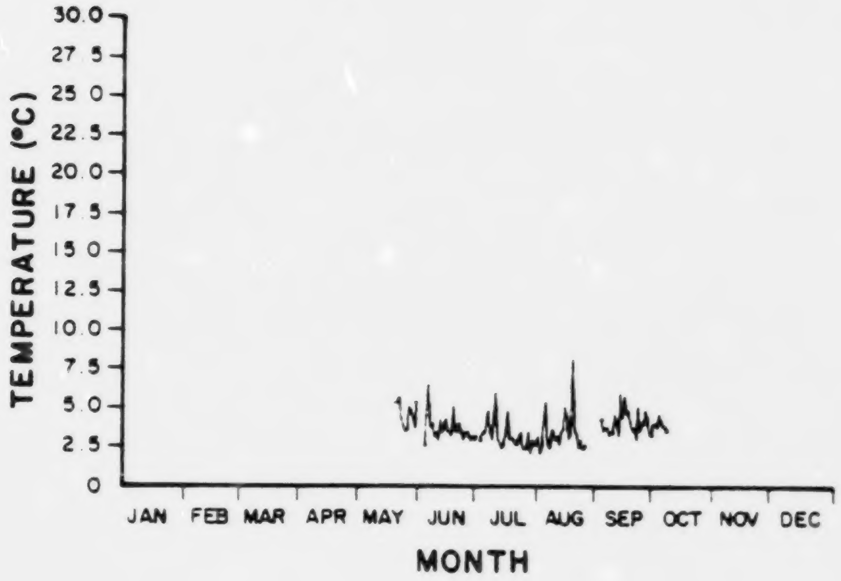
Great Central Lake 1980



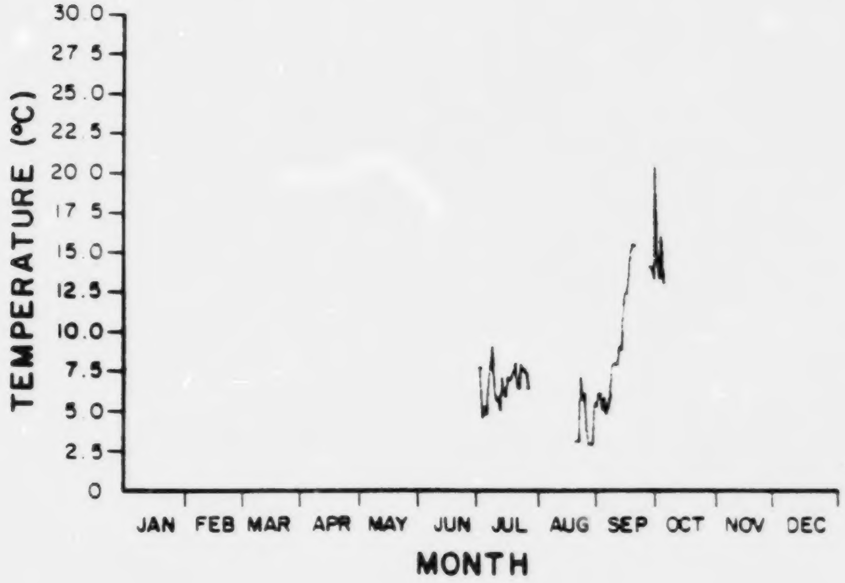
Great Central Lake 1982

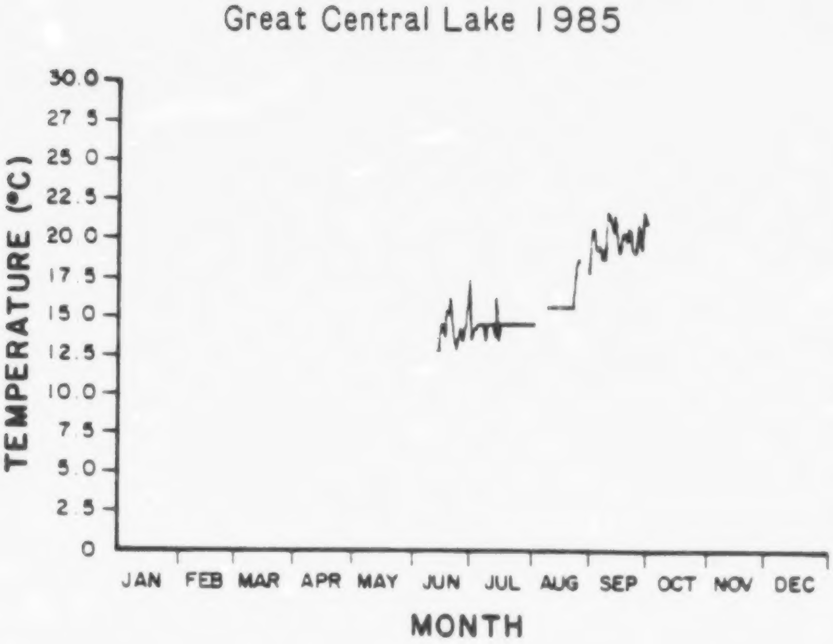


Great Central Lake 1983



Great Central Lake 1984





Great Central Lake 1985

Facility: SUSHWAP

Location:

Located immediately downstream of Shuswap Falls, 12 km northeast of Lumby.

Description:

The facility was built in 1984 as an experimental facility, to assess enhancement strategies and potential for chinook and coho production in the South Thompson area.

Egg production targets in 1985 were 250 K chinook, collected from the Middle Shuswap. When expansion is complete in 1986, the capacity will be roughly 1 M eggs.

Water Sources:

Surface. Water is pumped from the Shuswap River to the hatchery.

Groundwater. There are six wells at Shuswap (numbered 4, 5, 6, 8, 9, and 10) which supply water to the hatchery. Only well 5 operated during 1984 and 1985.

General Water Quality:

Well water is of very good quality, although the trace levels of iron and the moderately high levels of nitrate may create algal bloom problems. The water is moderately soft, low in dissolved oxygen and high in dissolved nitrogen. The river water is also high in phosphate and nitrate.

Special Notes:

Water temperature reported here are temperature profiles for wells 5 (1983) and 6 (1984). Additional data for the Shuswap River is reported in MacKinlay (1984). Other records are available from the Water Survey of Canada.

WATER QUALITY VALUES FOR SHUSWAP

[below detection limits = 0]

PARAMETERS	MAR13/84 SHUSWAP RIVER	JUN02/84 SHUSWAP RIVER	JUN02/84 SHUSWAP RIVER	MAY21/85 SHUSWAP RIVER	MAR15/84 WELL # 5	OCT27/84 WELL # 5	MAY14/85 WELL # 5	MAY14/85 WELL # 5	MAY21/85 WELL #10 2 HRS	MAY21/85 WELL #10 12 HRS	MAY22/85 WELL #10 24 HRS
Alkalinity	56	42		34.3	98	110	121		64.8	69.8	71.7
Ammonia	0	0		.01	.018	.007	0		0	0	0
CO2											
Chloride	.9	.8		.9	.9	1.8	1.5		1	1.1	.8
Color											
Conductivity Field				54					109	110	114
Conductivity Lab	136	102.2		83	237	298	310		168	170	175
Dissolved O2-ppm				10.9					4.4	4.4	4.5
Dissolved O2-%sat				100					40.4	40.4	41.3
Dissolved Gas Tot				106.3					95.8	94.8	95.2
Dissolved Nitrogen				109.1					110.8	109.5	109.8
Hardness	64.5	50.7	50	44.9	107.5	132	148	147	83.3	86.3	89.2
Nitrite	0	0		0	0	0	0		0	0	0
Nitrate	.13	.18		.115	0	.04	.041		.085	.088	.094
pH-Field				6.85					7.5	7.54	7.4
pH-Lab	7.8	7.5		7.4	7.3	7.9	7.9		7.3	7.8	7.8
Phosphate	.008	.018		0	.022	.008			0	0	0
Residue-Filterable		76		56	161	182	188		98	99	104
Residue-Nonfilterable		24		106	26	0	0		0	0	0
Silica											
Sulphate	8.9	6		5	17.3	31	33		11	11	12
Taste				SILTY					OK	OK	OK
Temperature				8.5					8.8	8.5	9
Turbidity	1.5	4.8		33	0	0	.65		.3	.3	.18
METALS											
Al-Aluminum	.1	.13	.14	.46	0	0	.08	0	0	0	0
As-Arsenic	0	0	0	0	0	0	0	0	0	0	0
Ba-Barium	.012	.011	.011	.019	.017	.031	.03	.031	.011	.011	.012
Ca-Calcium	21.2	16.8	16.6	14.1	36.7	42.4	47.6	47.9	28.8	29.4	30.8
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	.001	.002	0	0	0	0	.001	0	0	0
Fe-Iron	.113	.175	.172	.45	.242	.134	.118	.119	.01	.008	0
Hg-Mercury	0			0	.00005	0			0	0	0
K--Potassium	1.09	.81	.8	1	2.2	1.92	1.97	2.03	.9	.97	1.04
Mg-Magnesium	2.8	1.8	1.8	1.3	3.7	6.2	6.4	6.5	2.8	2.8	3
Mn-Manganese	.009	.012	.012	.015	.036	.032	.033	.034	.002	0	0
Mo-Molybdenum	0	0	0	0	0	0	0	0	0	0	0
Na-Sodium	1.4	1	1	.9	4.6	7.8	6.6	6.7	1.5	1.5	1.5
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus	0	0	0	0	0	0	.07	0	0	0	0
Pb-Lead	0	0	0	0	0	0	.001	.001	0	0	0
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	3.8	3.7	3.6	4.2	4.5	5.3	5.2	5.2	3.7	3.6	3.8
Sn-Tin	.01	0	.01	.01	0	.02	.01	.02	.02	.03	.04
Sr-Strontium	.098	.077	.075	.062	.189	.238	.19	.182	.115	.119	.123
Ti-Titanium	.003	.004	.005	.022	0	0	0	0	0	0	0
V--Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	.007	.004	.007		0	0	0	0	.01	0

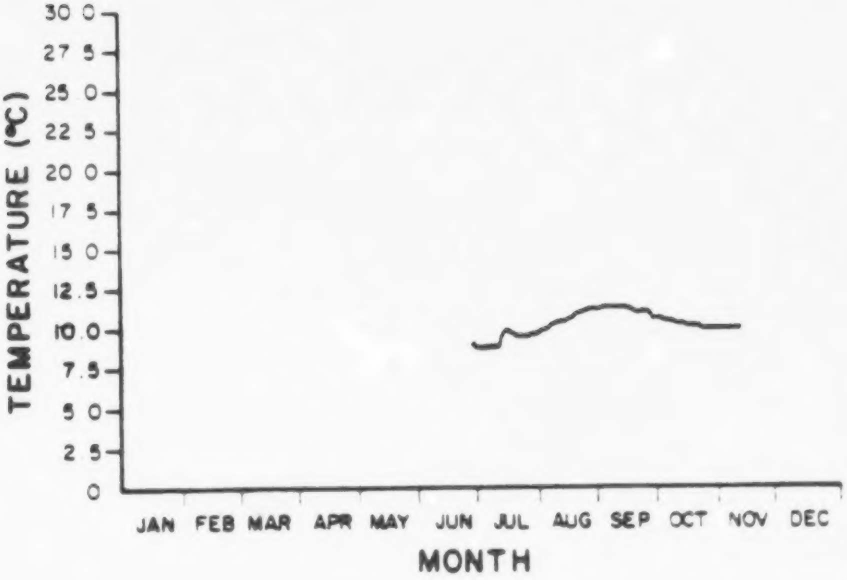
WELL 5 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE	8.3	8.9	8.6	1
JULY	8.3	9.5	8.83	31
AUGUST	9.2	10.8	10.1	31
SEPTEMBER	10	10.9	10.73	30
OCTOBER	9.5	10.4	9.8	31
NOVEMBER	9.5	9.5	9.5	14
DECEMBER		NO DATA		

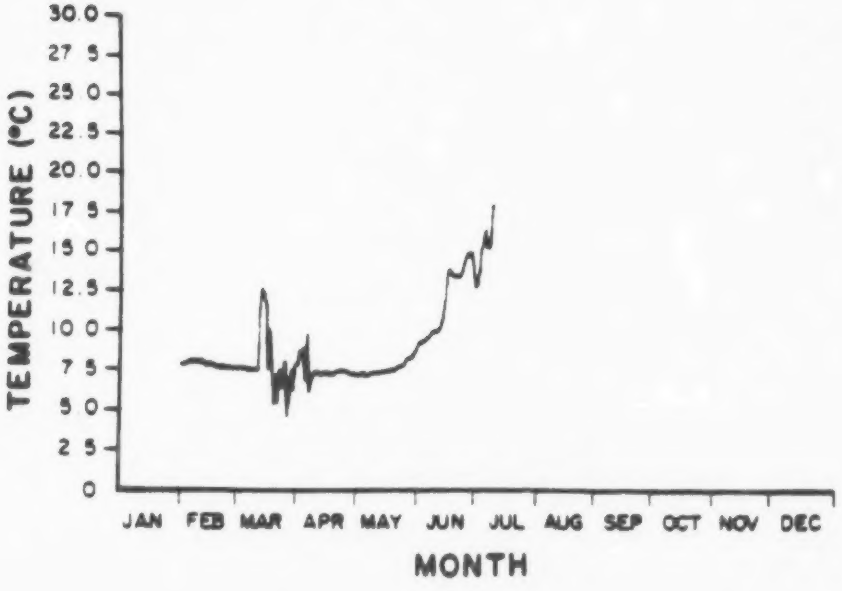
WELL 6 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	7.2	7.2	7.2	1
FEBRUARY	7	7.5	7.2	28
MARCH	1.7	16.1	7.27	31
APRIL	2	14	6.89	30
MAY	6.6	8.3	7.08	31
JUNE	8.4	14.8	11.46	30
JULY	3.2	32	14.69	10
AUGUST		NO DATA		
SEPTEMBER		NO DATA		
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

Well 5 1983



Well 6 1984



Facility: SNOOTLI

Location:

Located 15 km east of Bella Coola on the Central Coast of B.C.

Description:

This hatchery was built in 1978 as a pilot to test Japanese-style technology on a production level. It was completed as a full production facility in 1979, and expanded in 1985. The purpose of this facility is to allow for the harvest of Atnarko River pink salmon stocks without decimating the chum summer run.

Egg production targets in 1985 were 150 K coho, 2.46 M chinook, 7.7 M summer and 25 K fall chum, 140 K steelhead and 30 K cutthroat trout. Eggs are obtained from the Bella Coola system, Necleetsconnay River, and Wannock River. Juveniles are released back to the area of adult capture. Chinook and coho juveniles also are planted in underutilized areas in the Bella Coola system.

Water Sources:

Surface. A Finnigin wheel intake (10,910 lpm) provides gravity-fed water from Snootli Creek.

Groundwater. Eight wells (wells 1-3, wells 5-7 and wells SP1 and SP2) at Snootli supply over 6,000 lpm of water in total.

General Water Quality:

The water from Snootli Creek is silty during freshets, the pH is lower than neutral, and the temperature is colder than desireable, causing slow growth rates. The well water is of good quality. Temperatures are manipulated by mixing water sources.

Special Notes:

Well temperatures remain between 5 and 6°C year-round. However, separate well temperature profiles are not available, as temperatures are taken within the hatchery, after the well waters have been mixed. Water quality samples are taken from the intake at Snootli Creek and from the common supply pipe for the wells. Mixed well samples are present when more than one well is being pumped at the time samples were taken.

WATER QUALITY VALUES FOR SMOOTLI

(below detection limits = 0)

PARAMETERS	APR/78 WELL # 1	APR/78 WELL # 2	MAR27/79 WELL # 3	AUG20/84 14:30 WELL #7	AUG20/84 18:30 WELL #7	AUG20/84 22:30 WELL #7	AUG21/84 19:15 WELL #7	AUG01/85 19:00 WELL SP1	AUG02/85 07:00 WELL SP1	AUG03/85 17:00 WELL SP1	AUG06/85 15:30 WELL SP2
Alkalinity			7.11	6	5	5	4	6.4	5.9	5.4	7.8
Ammonia			0	.011	.007	.006	0	.007	.006	.008	.009
CO2											
Chloride			.55	4.4	4.7	5	4.9	0	.6	.8	.8
Color			clear								
Conductivity Field								20	23	36	21
Conductivity Lab			30.5	34.2	34.1	34.2	29.2	27	27.5	29	34
Dissolved O2-ppm	11.8	9.3	12	9.8	9.7	9.8	9.7	7.9	8	8.1	9.45
Dissolved O2-%sat	95	75	97					67.2	68.1	68.6	74.4
Dissolved Gas Tot	102	91	107					95.6	95.6	96.3	97.1
Dissolved Nitrogen			108					103.2	103	103.7	103.2
Hardness			11.3	9.98	10.3	10.7	10.2	9.48	9.39	10.1	11.9
Nitrite			0	0	0	0	0	.005	.007	.022	0
Nitrate			.187	.19	.2	.2	.08	1.9	1.99	.12	.21
pH-Field								6.3	6.35	6.3	6.35
pH-Lab			7	6.5	6.3	6.4	6.7	6.2	6	6.1	6.8
Phosphate			0	0	0	0	0	0	0	0	0
Residue-Filterable			21	32	32	32	31	18	18	17	26
Residue Non-Filter			0	25	25	25	25	0	0	5	0
Silica			2.62								
Sulphate				5	5	5	5	3	3	3	4
Taste			O.K.					OK	OK	OK	OK
Temperature	5.5	5.5	5					8.4	8.3	8.2	5.2
Turbidity				.1	20.1	20.1	20.1	.38	.23	.18	.38
METALS—											
Al-Aluminum				0	0	0	0	0	0	0	0
As-Arsenic				0	0	0	0	0	0	0	0
Ba-Barium			.0062	.008	.008	.008	.008	.006	.006	.006	.007
Ca-Calcium			4.18	3.4	3.6	3.8	3.7	3.5	3.5	3.7	4.3
Cd-Cadmium				0	0	0	0	0	0	.0062	0
Co-Cobalt								0	0	0	0
Cr-Chromium				0	0	0	0	0	0	0	0
Cu-Copper			0	0	.1	0	0	0	0	.001	0
Fe-Iron	.01	.01	0	.016	.007	.008	.008	.024	.014	.025	.024
Hg-Mercury			0	32	32	32	31	0	0	.00013	0
K—Potassium			.47	.94	.88	.89	.62	.65	.86	.75	.7
Mg-Magnesium			.198	.3	.3	.3	.2	.1	.2	.2	.2
Mn-Manganese			0	.018	.011	.009	0	.002	.002	.001	.011
Mo-Molybdenum			0	0	0	0	0	0	0	0	0
Na-Sodium			.53	1.6	1.4	1.3	.5	.6	.5	.6	.7
Ni-Nickle			0	0	0	0	0	0	0	0	0
P—Phosphorus			0	0	0	0	0	0	0	0	0
Pb-Lead			0	0	0	0	0	0	.002	0	0
Sb-Antimony			0	0	0	0	0	0	0	0	0
Se-Selenium			0	0	0	0	0	0	0	0	0
Si-Silicon				2.7	2.7	2.7	1.8	1.5	1.5	1.6	2.1
Sn-Tin				0	0	0	0	0	.01	0	0
Sr-Strontium			.017	.015	.016	.017	.015	.015	.015	.015	.019
Ti-Titanium			0	0	0	0	0	0	0	0	0
V—Vanadium			0	0	0	0	0	0	0	0	0
Zn-Zinc			0	0	.002	0	0	.011	0	.017	.003

*sample contaminated

WATER QUALITY VALUES FOR SNOOTLI

(below detection limits = 0)

PARAMETERS	AUG07/85 13:30 WELL SP2	FEB/79 WELLS # 1&2	MAR02/79 WELLS # 1&2	MAR19/79 WELLS # 1&2	APR02/79 WELLS # 1&2	APR17/79 WELLS # 1&2	MAY01/79 WELLS # 1&2	MAY16/79 WELLS # 1&2	MAY30/79 WELLS # 1&2	JUN13/79 WELLS # 1&2	FEB/80 WELLS # 1,2,3
Alkalinity	7.8	7.6	7.85	7.2	7.61	7.79	7.72	8.12	7.43	7.29	
Ammonia	.006	0	0	0	0	0	0	0	0	0	0
CO2							0	0	0		
Chloride	.7	0	0	0	0	0					
Color											
Conductivity Field	65										
Conductivity Lab	33	31.3	31.3	33.8	33.5	33.6	32.8	33.5	33.1	30	
Dissolved O2-ppm	9.9	12									
Dissolved O2-%sat	77.5										
Dissolved Gas Tot	98.7	102									
Dissolved Nitrogen	104.3										
Hardness	12.1	11.7	11	12	12	11.8	11.6		11.1	10.2	
Nitrite	0	0	0	0	0	0	0	0	0	0	
Nitrate	.21	.19	.19	.192	.265	23	.217	.225	.23	.213	
pH-Field	6.4										
pH-Lab	6.5	7.1	7.1	6.6	6.7	6.8	7	6.8	6.6	6.9	6.5
Phosphate	0										
Residue-Filterable	26	25	28	25	23	27					
Residue Non-Filter	0	0	0	0	0	0	0	0	0	0	
Silica											
Sulphate	4										
Taste	OK										
Temperature	5	5.5									5.7
Turbidity	.85										
METALS—											
Al-Aluminum	0										
As-Arsenic	0										
Ba-Barium	.007										
Ca-Calcium	4.4										
Cd-Cadmium	0										
Co-Cobalt	0										
Cr-Chromium	0										
Cu-Copper	.001	.01	0	0	0	0				0	
Fe-Iron	.125	0	0	.028	0	0				0	
Hg-Mercury	0	0	0	0	0	0	0	0	0	.0002	
K—Potassium	.7						0	0	0		
Mg-Magnesium	.2						0	0	0		
Mn-Maganeese	.005										
Mo-Molybdenum	0										
Na-Sodium	.7										
Ni-Nickle	0										
P—Phosphorus	0										
Pb-Lead	0	0	0	0	0	0	0	0	0	0	
Sb-Antimony	0										
Se-Selenium	0										
Si-Silicon	2.2										
Sn-Tin	0										
Sr-Strontium	.02										
Ti-Titanium	0										
V—Vanadium	0										
Zn-Zinc	.009	*	.067	0	0	0	0	0	0	0	

SNOOTLI CREEK 1980

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	NO DATA			
FEBRUARY	NO DATA			
MARCH	NO DATA			
APRIL	NO DATA			
MAY	-	-	6.93	31
JUNE	-	-	8.64	30
JULY	-	-	8.92	31
AUGUST	-	-	9.4	31
SEPTEMBER	-	-	7.98	30
OCTOBER	-	-	6.67	31
NOVEMBER	-	-	5.36	22
DECEMBER	-	-	3.73	24

SNOOTLI CREEK 1981

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	-	-	3.36	31
FEBRUARY	-	-	3.4	21
MARCH	-	-	4.63	31
APRIL	-	-	5.67	23
MAY	NO DATA			
JUNE	-	-	7.6	23
JULY	-	-	8.3	1
AUGUST	NO DATA			
SEPTEMBER	NO DATA			
OCTOBER	NO DATA			
NOVEMBER	NO DATA			
DECEMBER	NO DATA			

SNOOTLI CREEK 1982

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE	4.45	6.95	5.63	28
JULY	6.07	8.35	6.86	31
AUGUST	6.07	8.35	7.35	31
SEPTEMBER	5.83	7.78	6.72	30
OCTOBER	4.45	6.85	6.14	31
NOVEMBER	1.1	1.4	1.25	30
DECEMBER	1.1	1.4	1.25	31

SNOOTLI CREEK 1983

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY	.6	1.1	.85	31
FEBRUARY	.7	1.1	.9	28
MARCH	1.1	1.6	1.35	31
APRIL	1.4	5	3.8	30
MAY	4.4	7.23	5.58	31
JUNE	4.6	7.78	6.16	30
JULY	5.3	9.45	7.64	31
AUGUST	8.25	10	9.12	31
SEPTEMBER	7.05	9.5	8.14	30
OCTOBER		NO DATA		
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

SNOOTLI CREEK 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY	6.1	8.2	6.99	31
JUNE	6.3	7.7	7.16	30
JULY	6.67	8.4	7.58	31
AUGUST	6.8	8.4	7.69	31
SEPTEMBER	5.6	7.23	6.53	30
OCTOBER	4.45	6.7	5.7	31
NOVEMBER	4.4	6.12	5.22	30
DECEMBER	4.1	8.35	5.2	31

MIXED WELLS 1981

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY		NO DATA	
FEBRUARY		NO DATA	
MARCH		NO DATA	
APRIL		NO DATA	
MAY		NO DATA	
JUNE		NO DATA	
JULY		NO DATA	
AUGUST	6.4	6.7	6.5
SEPTEMBER	6.8	7.3	7.2
OCTOBER	7	7.3	7.2
NOVEMBER	6	7	6.5
DECEMBER	4.9	6	5.5

MIXED WELLS 1982

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	4.4	5	4.7
FEBRUARY	4	4.4	4.2
MARCH	4.1	4.5	4.3
APRIL	4.3	5	4.6
MAY	4.9	5.7	5.2
JUNE	-	-	6
JULY	-	-	7
AUGUST	-	-	7
SEPTEMBER	-	-	7.5
OCTOBER	-	-	6.8
NOVEMBER	-	-	6
DECEMBER	-	-	6

MIXED WELLS 1983

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	-	-	6
FEBRUARY	4.5	6	5.7
MARCH	-	-	4.8
APRIL	-	-	5.5
MAY	-	-	6
JUNE	-	-	6
JULY	-	-	6
AUGUST	-	-	6
SEPTEMBER	-	-	6
OCTOBER	-	-	7
NOVEMBER	-	-	7
DECEMBER	-	-	7

MIXED WELLS 1984

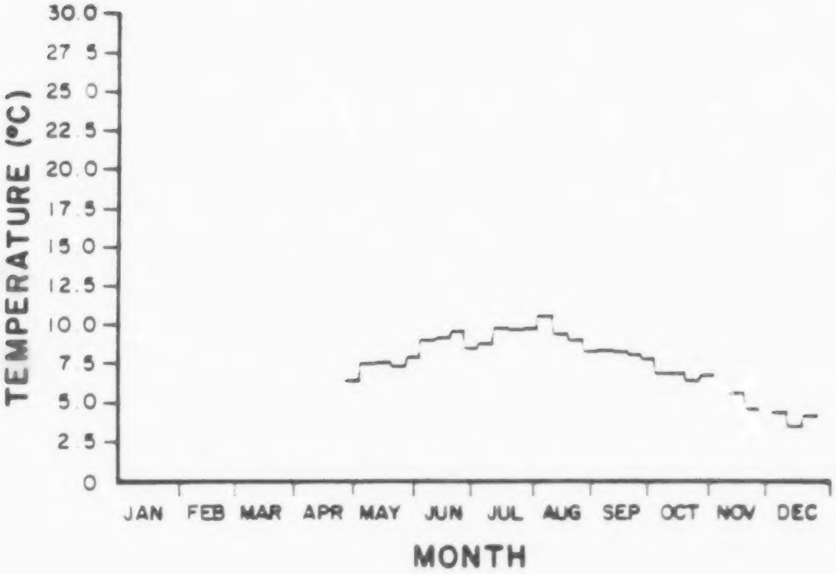
MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	5.5	7	5.7
FEBRUARY	-	-	5.5
MARCH	-	-	5.5
APRIL	-	-	6
MAY	-	-	6.5
JUNE	-	-	6.5
JULY	-	-	7
AUGUST	-	-	7
SEPTEMBER	-	-	7
OCTOBER	-	-	7
NOVEMBER	-	-	7
DECEMBER	-	-	6

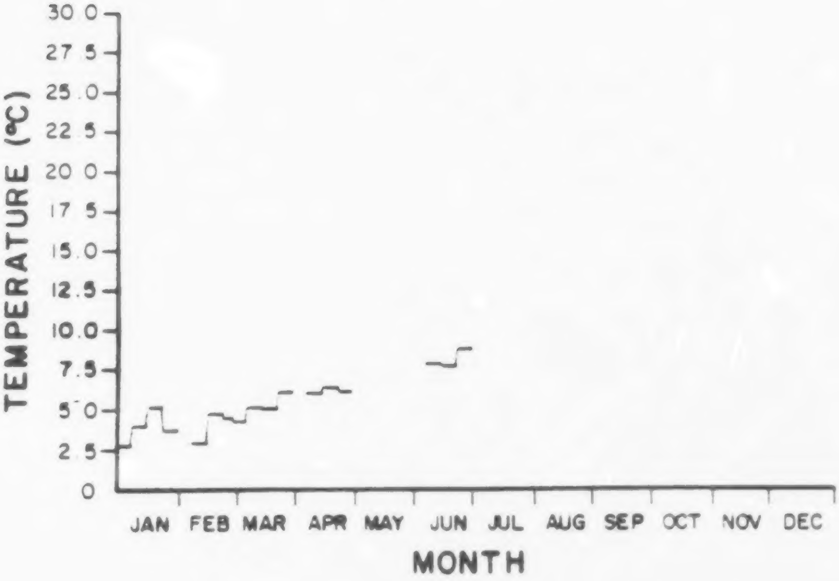
MIXED WELLS 1985

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	-	-	6
FEBRUARY	-	-	6
MARCH	-	-	6
APRIL	-	-	6
MAY	-	-	6
JUNE	-	-	5.5
JULY	-	-	5.7
AUGUST	-	-	5.7
SEPTEMBER	5.7	6	5.7
OCTOBER	6	6.4	6.2
NOVEMBER	6	6.4	6.3
DECEMBER	5.5	6	5.9

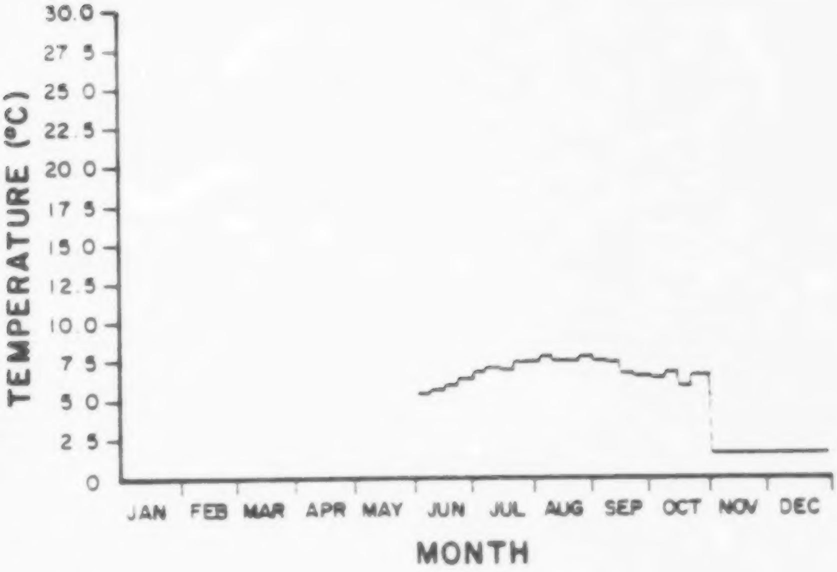
MIXED WELLS 1986

MONTH	MIN.C	MAX.C	MEAN.C
JANUARY	-	-	6
FEBRUARY	4.5	6.4	5.2
MARCH	-	-	5
APRIL	-	-	5.5
MAY	-	-	5.5
JUNE		NO DATA	
JULY		NO DATA	
AUGUST		NO DATA	
SEPTEMBER		NO DATA	
OCTOBER		NO DATA	
NOVEMBER		NO DATA	
DECEMBER		NO DATA	

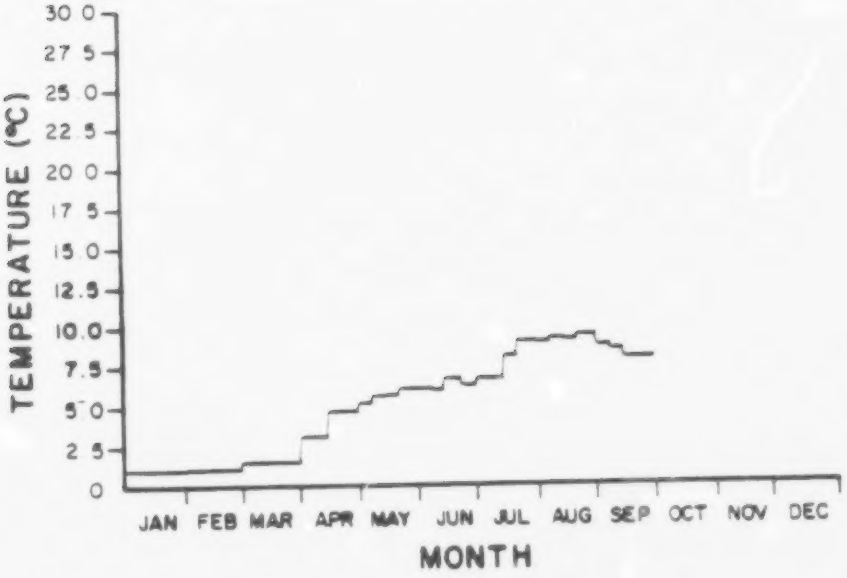

Snootli Creek 1980


Snootli Creek 1981

Snootli Creek 1982



Snootli Creek 1983



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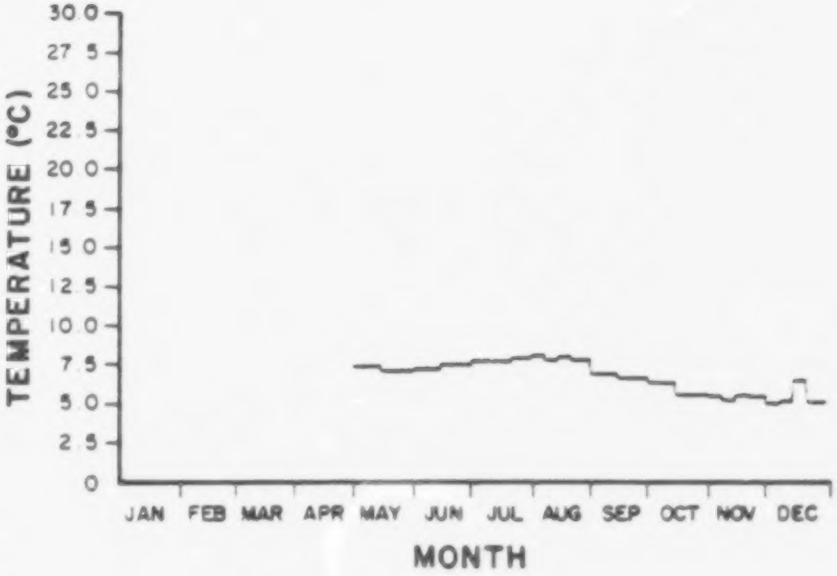


Facility: SPIUS

Location:

Located on Spius Creek near its confluence with the Nicola River, approximately 18 km west of Merritt.

Description:

Completed in 1984, the hatchery was built as an experimental facility, to assess enhancement strategies and potential for chinook and coho enhancement in the North Thompson River area.

The egg capacity of the experimental facility is roughly 1.4 M chinook eggs and 850 K coho eggs. Eggs are to be obtained from the Nicola system.

Water Sources:

Surface. A gravity-feed intake can supply up to 11,895 lpm of Spius Creek water to the hatchery.

Groundwater. Three wells are in operation at Spius Creek, well #1 (now well B), well #2 (well A) and well #3 (well C), and can supply approximately 8800 lpm of water in total. The well numbering was as a result of chronological development; they were renamed in spatial order to avoid confusion. Water from well A has been used throughout facility operations; well B has been used sporadically; well C not at all.

General Water Quality:

Except for low oxygen and high nitrogen saturation levels, and slightly high manganese, magnesium and zinc levels (the effects of which are counteracted by the hardness of the water), the well water is considered to be of good quality. The creek water has slightly high nitrogen saturation levels and can be silty during spring run-off. The water temperature for the creek can be too cold for its exclusive use, but can be mixed with well water.

Special Notes:

For wells A and B, during pilot phase (prior to 1984), the temperatures were 10.0 ± 0.2°C. Water quality and temperature records were taken prior to aeration for separately reported wells, and after areation for mixed wells (mixing of water occuring at the aeration tower). Additional water temperature records for well A and water quality records for Spius Creek and wells A, B and C are available in MacKinlay, 1984).

WATER QUALITY VALUES FOR SPIUS
(below detection limits = 0)

PARAMETERS	JUN20/84 WELL C 21:35 HR	JUN21/84 WELL C 05:30 HR	FEB11/86 WELL C	FEB20/86 WELL C	FEB20/86 WELL C	MAR12/86 WELL C	MAR12/86 WELL C	FEB20/86 MIXED WELLS	FEB20/86 MIXED WELLS	FEB20/86 MIXED WELLS	FEB20/86 MIXED WELLS
Alkalinity	184	184	185								
Ammonia	.018	.018	.013								
CO2											
Chloride	2	1.8	2.3								
Color											
Conductivity Field											
Conductivity Lab	425	425	430								
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness	195	193		188	185	202	203	187	187	190	190
Nitrite	0	0	0								
Nitrate	0	0	0								
pH-Field			8								
pH-Lab	7.7	7.7									
Phosphate	.007	.008	.013								
Residue-Filterable	270	270	288								
Residue-Nonfilterable	0	0	6								
Silica	7.9	7.8									
Sulphate	39	40	40								
Taste											
Temperature											
Turbidity	.8	.3	0								
METALS											
Al-Aluminum	0	0	0	0	0	0	0	0	0	0	0
As-Arsenic	0	0	0	0	.05	0	0	0	0	0	0
Ba-Barium	.031	.031	.03	.031	0	.03	.03	.032	.032	.024	.033
Ca-Calcium	52.4	51.9	55.7	48.9	48.7	54.4	54.7	48.9	50	49.8	50
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0	0									
Fe-Iron	0	0	.007	.015	.008	.01	.006	0	0	0	0
Hg-Mercury	0	0	0								
K—Potassium	2.23	2.28									
Mg-Magnesium	15.7	15.5	16	14.9	14.7	15.9	16	15.1	15.1	15.9	15.8
Mn-Manganese	.141	.139	.138	.128	.073	.132	.133	.109	.107	.065	.091
Mo-Molybdenum	0	.005	0	0	0	0	0	.008	0	0	0
Na-Sodium	16.7	16.4	13.2	13.2	13	13.3	13.4	13.1	13	14.1	13.7
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P—Phosphorus	0	0	0	0	0	0	0	0	0	0	0
Pb-Lead	.002	.002									
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	7.9	7.8	6	5.?	5.5	6.3	6.5	5.2	5	5.4	5.2
Sn-Tin	.01	0	.03	.03	0	.03	.03	.02	.03	0	.03
Sr-Strontium	.288	.284	.287	.278	.159	.283	.285	.277	.275	.21	.286
Ti-Titanium	0	0	0	0	0	0	0	0	0	0	0
V—Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	.004	0	0	0	0	0	0	0	0	.002	0

WATER QUALITY VALUES FOR SPIUS
(below detection limits = 0)

PARAMETERS	FEB11/86 WELL A	FEB20/86 WELL A	FEB20/86 WELL A	MAR12/86 WELL A	MAR12/86 WELL A	MAR12/86 WELL B	MAR12/86 WELL B	APR04/84 WELL C 22:00 HR	APR05/84 WELL C 15:00 HR	JUN19/84 WELL C 17:20 HR	JUN20/84 WELL C 11:30 HR
Alkalinity	183					192		37	88	184	184
Ammonia	.012					.0743		0	0	.021	.019
CO2											
Chloride	1.8					1.6		.6	1.3	2.1	2
Color											
Conductivity Field											
Conductivity Lab	430					465		86.5	209	428	426
Dissolved O2-ppm											
Dissolved O2-%sat											
Dissolved Gas Tot											
Dissolved Nitrogen											
Hardness		195	186	205	206	206	207	38.7	95.9	187	196
Nitrite	0					0		0	0	0	0
Nitrate						.069		0	0	0	0
pH-Field	8.1										
pH-Lab						8		7.6	8.7	7.7	7.7
Phosphate								.005	.003	.06	.013
Residue-Filterable	270					284		73	146	270	270
Residue-Nonfilterable	0					0		0	0	41	7
Silica								5.3	3.2	8	8
Sulphate	39					47		4.2	14.5	39	40
Taste											
Temperature											
Turbidity	0					.13		.5	2.5	23	3.8
METALS											
Al-Aluminum	0	0	0	0	0	0	0	.08	.1	0	0
As-Arsenic	0	0	0	0	0	0	.07	0	0	0	0
Ba-Barium	.031	.031	.03	.03	.03	.03	.031	.016	.03	.031	.032
Ca-Calcium	54.9	49.4	49.7	55.1	55.4	53.9	54.1	11.6	26.7	49	52.5
Cd-Cadmium	0	0	0	0	0	0	0	0	0	0	0
Co-Cobalt		0	0	0	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0	0	0	0	0
Cu-Copper	0					0	0	0	.002	.002	0
Fe-Iron	0	0	.006	.013	.012	.03	.033	.058	.13	0	0
Hg-Mercury	0					0		0	0	0	0
K--Potassium						1.75	1.77	.51	1.5	2.34	2.28
Mg-Magnesium	17.1	14.9	14.9	16.3	16.4	17.4	17.4	2.4	7.1	15.8	15.8
Mn-Manganese	.077	.125	.125	.103	.103	.115	.116	.002	.027	.089	.14
Mo-Molybdenum	0	.005	0	0	0	0	0	0	0	.005	0
Na-Sodium	13.7	13.5	13.5	13.6	13.7	15	14.9	2.6	5.9	17.6	17.1
Ni-Nickel	0	0	0	0	0	0	0	0	0	0	0
P--Phosphorus	.011	0	0	0	0	.008	0	0	0	0	0
Pb-Lead	0					0	0	.001	.001	.002	.002
Sb-Antimony	0	0	0	0	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0	0	0	0	0
Si-Silicon	5.7	5.2	5.4	6.4	6.4	6.5	6.5	5.3	3.2	8	8
Sn-Tin	.01	.01	0	.03	.01	.02	.03	0	0	0	.02
Sr-Strontium	.266	.27	.27	.269	.27	.274	.276	.071	.149	.265	.268
Ti-Titanium	0	0	0	0	0	0	0	0	.002	0	0
V--Vanadium	0	0	0	0	0	0	0	0	0	0	0
Zn-Zinc	0	0	.005	0	0	0	0	.003	0	0	0

Facility: TENDERFOOT

Location:

Located 26 km north of Squamish on Tenderfoot Creek.

Description:

Operations began in 1981, when chinook eggs were incubated and reared at Capilano and transferred as fry to Tenderfoot. Full production began in 1982. The facility was built to enhance chinook and coho stocks in the Squamish system.

Egg production targets in 1985 were 400 K coho, 500 K chinook and 98 K steelhead. Eggs are obtained from Squamish River, Ashlu River, Cheakamus River, Mamquam River, Shovelnose Creek, Tenderfoot Creek and 36 Mile Creek. Coho and steelhead juveniles are released back to their stream of origin. Chinook juveniles are released into Tenderfoot Creek.

Water Sources:

Surface. There is no surface water supply.

Groundwater. Three wells (#1, #2 and #3) currently supply all the water for the hatchery.

General Water Quality:

The groundwater is of good quality, although temperatures could be 3-4°C higher for chinook and steelhead incubation and rearing. No temperature manipulation is possible.

Special Notes:

All three wells remain at a constant 7°C year-round. For this reason, no graphs or tables of temperatures are included. Additional water quality records for Tenderfoot Creek, wells #1 and #2 are available in MacKinlay (1984).

WATER QUALITY VALUES FOR TENDERFOOT
(below detection limits = 0)

PARAMETERS	JAN18/84 WELL # 2	JAN18/84 WELL # 3	MAY23/84 WELL # 3	JAN18/83 MIXED WELLS	JUN23/83 MIXED WELLS
Alkalinity	27	27	25	29	27
Ammonia	.102	0	.009	0	.009
CO2					
Chloride	2.4	2.3	1.8	2.8	2
Color					
Conductivity Field					
Conductivity Lab	85.1	84.1	75.9	83.4	78.2
Dissolved O2-ppm					
Dissolved O2-%sat					
Dissolved Gas Tot					
Dissolved Nitrogen					
Hardness	33.1	33	28.8	31.7	32
Nitrite	0	0	0	0	0
Nitrate	.14	.08	.07	.07	.07
pH-Field	6.9	7.1			
pH-Lab			6.7	7.1	7.2
Phosphate	.027	.009	.012	.006	.01
Residue-Filterable	71	70	62	61	58
Residue-Nonfilterable	0	0	0	0	7
Silica				6.4	6.7
Sulphate	7.3	7.2	7	7.5	8.4
Taste					
Temperature					
Turbidity	0	0	0	0	0
METALS					
Al-Aluminum	0	0	0	0	0
As-Arsenic	0	0	0	0	0
Ba-Barium	.004	.004	.003	.003	.003
Ca-Calcium	12	11.9	10.4	11.4	11.6
Cd-Cadmium	0	0	0	0	0
Co-Cobalt	0	0	0	0	0
Cr-Chromium	0	.019	0	0	0
Cu-Copper	0	0	.001	0	0
Fe-Iron	0	0	0	.023	0
Hg-Mercury			0	0	0
K—Potassium	.941	.941	.88	.88	.88
Mg-Magnesium	.8	.8	.7	.8	.7
Mn-Manganese	.001	.002	0	.001	0
Mo-Molybdenum	0	0	0	0	0
Na-Sodium	2.5	2.5	2.4	2.7	2.4
Ni-Nickel	0	0	0	0	0
P—Phosphorus	.06	0	0	0	0
Pb-Lead	0	0	0	0	0
Sb-Antimony	0	0	0	0	0
Se-Selenium	0	0	0	0	0
Si-Silicon	6.8	6.8	6.2	6	6.2
Sn-Tin	0	0	0	0	0
Sr-Strontium	.083	.083	.081	.08	.069
Ti-Titanium	0	0	0	0	0
V—Vanadium	0	0	0	0	0
Zn-Zinc	0	.009	0	.002	0

Facility: **WHITEHORSE RAPIDS**

Location:

Located on the east side of the Yukon River near the Whitehorse City Works Yard, downstream of the Northern Canada Power Commision Dam.

Description:

Built by the Northern Canada Power Commision in 1984, to mitigate for hydroelectric development at Whitehorse Rapids.

Egg production target in 1985 was 500 K chinook. Eggs are obtained from the Yukon River fishway, and juveniles are released at Wolf and Michie Creeks.

Water Sources:

Surface. Surface water is supplied by gravity feed from the Yukon River, from the Schwatka Reservoir via the municipal waterline to the hatchery.

Groundwater. Whitehorse City wells #2 and #3 presently provide all the groundwater for the site. City wells #1,#4 and #6 have been monitored for possible use, as well as the Whitehorse Rapids well #2-85 (RH-2-85).

General Water Quality:

Summer water temperatures from the Yukon River are felt to be to warm for the incubation of northern chinook stocks, and may not be used after 1986.

Well waters are moderately hard, slightly alkaline and high in dissolved nitrogen, but low in dissolved oxygen. Well RH-2-85 is slightly warmer (between 5.2 and 6.0 C) than the city wells (4.8 C). This is probably because of its greater depth.

Special Notes:

The city well water temperatures remain at 4.8^{o}C year-round, and there has been only spot checks for well RH-2-85, thus no graphs or tables for the wells appear here. One water quality record for "Hatchery water" is from an unknown source within the hatchery. Additional water quality records for city wells #1, #4, and #6 and from the Yukon River are available in MacKinlay (1984).

WATER QUALITY VALUES FOR WHITEHORSE

[below detection limits = 0]

PARAMETERS	MAR10/84 CITY WELL #4	NOV13/85 WELL RH-2-85	NOV14/85 RH-2-85 08:30 HR	NOV14/85 RH-2-85 15:00 HR	NOV16/85 WELL RH-2-85	NOV16/85 WELL RH-2-85	NOV14/85 HATCHERY WATER
Alkalinity	42	113	105	103	101	99.8	110
Ammonia	0	.009	.008	.008	.007	.005	.008
CO2							
Chloride	.5	4.5	3.4	3.5	2.9	3	1.6
Color							
Conductivity Field							
Conductivity Lab	98.7	280	250	245	235	235	285
Dissolved O2-ppm							
Dissolved O2-%sat							
Dissolved Gas Tot							
Dissolved Nitrogen							
Hardness	46.6				104	104	
Nitrite	0	0	0	0	0	0	0
Nitrate	.02	.022	.032	.03	.028	.028	.044
pH-Field							
pH-Lab	7.5	8.1	8.2	8.2	8.2	8.2	8
Phosphate	.004						
Residue-Filterable	66	165	154	143	147	141	177
Residue-Nonfiltera	0	0	0	0	0	0	0
Silica							
Sulphate	6.4	19	17	17	23	16	30
Taste							
Temperature							
Turbidity	0	.33	.28	.18	.18	.15	.23
METALS							
Al-Aluminum	0				0	0	
As-Arsenic	0	0	0	0	0	0	0
Ba-Barium	.027	.023	.022	.021	.02	.02	.04
Ca-Calcium	14.4	17.5	16.4	16.2	15.5	15.5	24
Cd-Cadmium	.0026	0	0	0	0	0	0
Co-Cobalt	0	0	0	0	0	0	0
Cr-Chromium	0	0	0	0	0	0	0
Cu-Copper	.001	0	0	0	0	0	0
Fe-Iron	.067	.063	.04	.034	.028	.025	0
Hg-Mercury	0	.00008	.00008	.00008	0	0	.00008
K--Potassium	.87	1.51	1.47	1.45	1.39	1.44	1.92
Mg-Magnesium	2.5	20.4	18.3	18	15.9	15.8	17.1
Mn-Manganese	.03	.024	.016	.015	.014	.013	0
Mo-Molybdenum	0	0	.006	0	.007	.007	.009
Na-Sodium	1.3	10.9	9.1	8.9	7.6	7.678	10.4
Ni-Nickel	0	0	0	0	0	0	0
P--Phosphorus	0	.07	.09	.07	.035	.03	0
Pb-Lead	0	0	0	0	0	0	0
Sb-Antimony	0	0	0	0	0	0	0
Se-Selenium	0	0	0	0	0	0	0
Si-Silicon	1.5	6.5	5.9	5.8	5.2	5.1	ERROR
Sn-Tin	0	.01	0	.01	0	.02	.01
Sr-Strontium	.075	.116	.108	.107	.102	.103	.197
Ti-Titanium	0	0	0	0	0	0	0
V--Vanadium	0	0	0	0	0	0	0
Zn-Zinc	.006	0	0	0	0	0	0

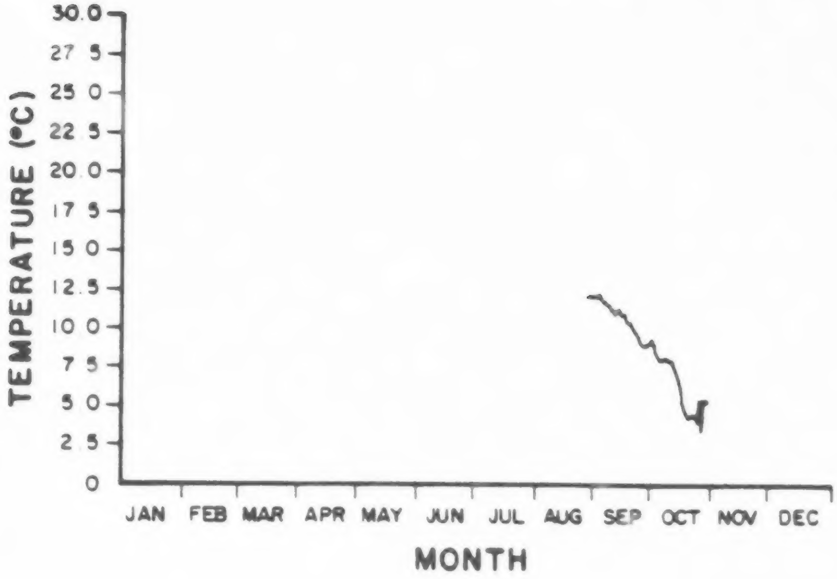
YUKON RIVER 1984

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST	-	-	11.6	1
SEPTEMBER	-	-	10.2	30
OCTOBER	-	-	5.92	31
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

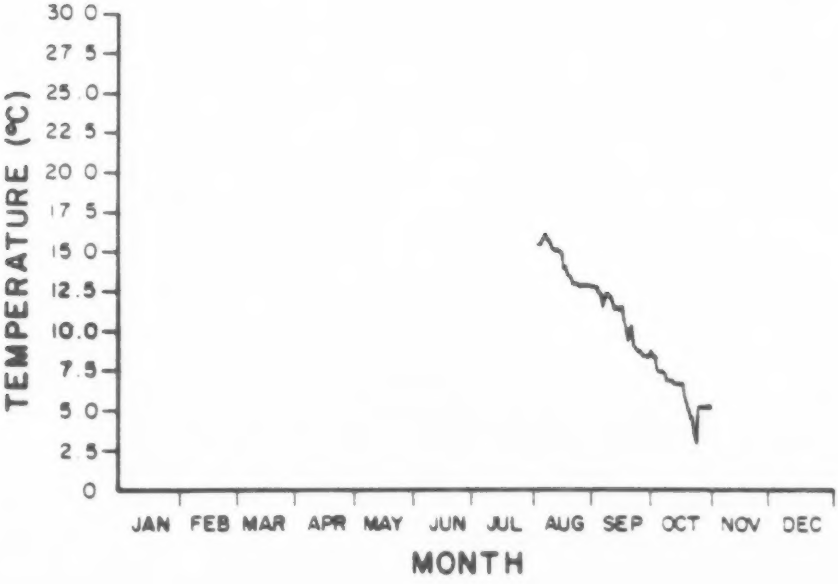
YUKON RIVER 1985

MONTH	MIN.C	MAX.C	MEAN.C	# OF DAYS
JANUARY		NO DATA		
FEBRUARY		NO DATA		
MARCH		NO DATA		
APRIL		NO DATA		
MAY		NO DATA		
JUNE		NO DATA		
JULY		NO DATA		
AUGUST	12.2	16.2	13.86	27
SEPTEMBER	12.3	12.6	10.33	30
OCTOBER	-	-	5.75	31
NOVEMBER		NO DATA		
DECEMBER		NO DATA		

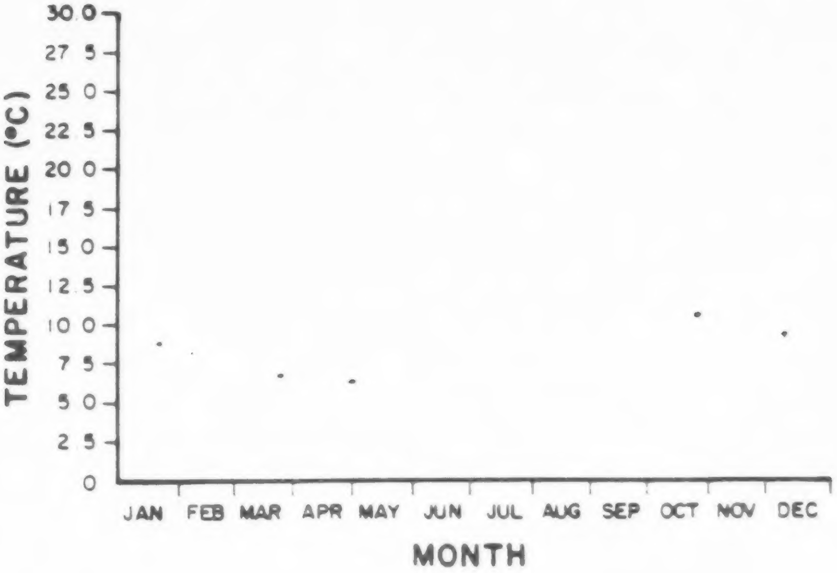
Yukon River 1984



Yukon River 1985



Well OW-1 1985



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